THE DECODE KNOWLEDGE PROJECT

THE DECODE PROJECT: CO-CONSTRUCTION, DECOLONISATION & TRANSFORMATION
PRODUCING ACTIONABLE KNOWLEDGE FOR THE CHALLENGES OF OUR TIMES

"Knowledge Was Always Systematized": Community-Based Participatory Research Case Studies Focused on Understanding Community and/or Indigenous Knowledge Used to Address Climate Change Issues and Develop Climate Resiliency

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Summary

This paper introduces the DECODE project, explains its approach to conducting community-based participatory research, and explores why deepening our collective understanding of community and/or Indigenous knowledge cultures matters in a modern world currently facing climate crises. Two key research questions were posed to support this paper's creation and the analysis of the case studies. These research questions included:

1) What do the DECODE case studies reflect about community-based participatory research processes? and

2) What lessons were learned (the preliminary findings) from these six case studies regarding community and/or Indigenous-based approaches to climate resiliency?

Aligned with a knowledge democracy framework, DECODE established a community-based participatory research approach to support the development of the case studies. Through cycles of partnership engagement, data collection, sharing and analysis, and knowledge mobilization, the DECODE project team has collaborated with six community-based research initiatives from diverse regions (including Malaysia, India, Uganda, Columbia, the Arctic, and Western Canada) that have focused on community and/or Indigenous knowledge to address climate change issues and develop climate resiliency. Stemming from these collective efforts, the six case studies created, were:

Modernization of Apong Production: A collaboration between local Apong harvesters (Penuak) in Sarawak and the University of Malaysia Sarawak (UNIMAS) supported the modernization of traditional Apong production by developing and using hybrid stoves. This project preserved local knowledge and mangrove ecosystems while enhancing the economic and social empowerment of the Penuak community.

The Women's Cooperative: The Women's Cooperative, HARC—Alaknanda Krishi Vyavsya Bahuudeshya Swayat Sahkarita (HAKVBSS), located in Uttarakhand, engaged in sustainable agriculture and used traditional knowledge to produce high-value, wild edibles for the marketplace. This community-based initiative empowered women, preserved traditional practices, and enhanced livelihood resilience against climate change.

Regenerating Acholi Traditional Knowledge: Regenerative practices helped to cultivate and share traditional Acholi knowledge, address climate change, and empower women in Uganda. Acholi knowledge was also integrated into Gulu University through a formal Herbal Medicine certificate program. The partnership between the university and local herbalists bridged traditional and scientific knowledge while supporting regenerative practices, community-based healthcare, and educational capacity.

Guardians of the Forest: Located in the Putumayo region of Columbia, the program's objectives focused on training and empowering women from three Indigenous communities (e.g., Emberas, Yanakonas, and Pastos) by connecting them to their local knowledge and recognizing the value of the territory, native plants, and conservation efforts.

Nanuk Narratives: Nanuk Narratives highlighted community members' voices (e.g., seasoned hunters, respected Elders, cooks, and youth) from Nunavut, Nunavik, Nunatsiavut, and Greenland by exploring the connections between Inuit and Polar bears with the Davis Strait region of the Arctic. The film series shared diverse, multi-generational experiences and knowledge. Inuit stories also offered unique perspectives on how polar bears were woven into life's cultural and ecological dimensions, highlighting the challenges and stewardship practices that have sustained this enduring bond.

Using Indigenous Research to Plan for Future Pandemics: During the COVID-19 pandemic, research teams engaged directly with community members from Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation through a series of capacity-building workshops and gatherings informed by Indigenous research methods. This research focused on how the COVID-19 pandemic and its associated restrictions exacerbated the impacts of climate change on the health and well-being of Indigenous peoples from Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation in central British Columbia, Canada.

Preliminary findings from the case studies were separated into two overarching and interconnected sections. Section one focused on what the DECODE case studies revealed about research processes. Section two helped to deepen collective understandings of community and/or Indigenous knowledge related to addressing modern challenges (e.g., climate issues and developing climate resiliency). An initial review of the preliminary findings also generated key messages for further analysis and discussion.

Comparative analysis of six DECODE case studies indicated several key messages about community-led research for climate resilience:

1. Community/indigenous knowledge is not the **enemy** of academic knowledge. These case studies show how interactions between community knowledge keepers and academic researchers were able to work together to achieve research purposes.
2. Community/Indigenous knowledge is more than ***know-how***; it is part of community culture and identity; it is embedded in a spiritual worldview with values of sustainability, conservation and inclusion, expressed in local languages & dialects.
3. Practical needs of the community define trigger new knowledge production and mobilization. When academic researchers integrate the same in defining shared research ***purposes***, interest in partnerships develops.
4. Recognition of distinctive community/indigenous ***knowledge cultures*** encourages the building and nurturing of partnerships of mutual respect and trust over time. Bridging knowledge cultures is facilitated through intermediaries of diverse forms, specific to each context.
5. Methods of Community-based Participatory Research ***(CBPR***), especially arts-based and culturally appropriate, support the inclusion of community knowledge in the entire research process through the creation of safe spaces for authentic collaboration.
6. Multiple ***forms of knowledge dissemination*** are deployed to reach a diversity of stakeholders. Both academic and popular forms of knowledge sharing are necessary for realizing the purposes of research established in the beginning.
7. Women's leadership and knowledge are central to such community-led initiatives. Gender relations in the community are transformed through public articulation of ***women's holistic knowledge*** about nature (land, forest, water, plants, animals, etc.).
8. Open discussion and agreements about knowledge sharing, knowledge ownership, and benefit sharing are key to building and sustaining trusting partnerships. Conversations about these ***ethical issues*** need to be held from the beginning and continue throughout the partnership.
9. ***Co-management*** and co-governance mechanisms between community and academic partners support impactful knowledge mobilization and sustained impacts. Community-driven co-management protocols help, even when formal arrangements of co-governance are not institutionalized.
10. As the six cases show, such research produces ***impacts on climate resilience*** and local livelihoods. Investments in building capacity during and beyond the research process further strengthen and empower community organizations.

The DECODE Project's next steps are to verify case studies' preliminary findings and key messages with community perspectives through additional cycles of participant engagement, data collection, sharing and analyzing, and knowledge mobilization. Therefore, DECODE's next steps are to connect with community members by sharing the preliminary findings, Story Maps, and peer learning opportunities (e.g., webinars and discussion papers).

"Knowledge Was Always Systematized": Community-Based Participatory Research Case Studies Focused on Understanding Community and/or Indigenous Knowledge Used to Address Climate Change Issues and Develop Climate Resiliency

The statement "Knowledge Was Always Systematized" was shared by Miss Julie, who was part of the case study from Uganda.

Introduction

This paper introduces the DECODE project, explains its approach to conducting community-based participatory research, and explores why deepening our collective understandings of community and/or Indigenous knowledge cultures matters in a modern world facing climate crises. Two key research questions were posed to support this paper's creation and the analysis of the case studies. These questions included:

1) What do the DECODE case studies reflect about community-based participatory research processes? and

2) What lessons were learned (the preliminary findings) from these six case studies regarding community and/or Indigenous-based approaches to climate resiliency?

Preliminary findings from six diverse case studies have supported the DECODE Project in furthering its understanding of community and/or Indigenous knowledge cultures.

What is The DECODE Project?

The DECODE project, led by the United Nations Educational, Scientific and Cultural Organization (UNESCO) Chair in Community-Based Research and Social Responsibility in Higher Education (co-chaired by Dr. Budd L Hall and Dr. Rajesh Tandon), was funded by the International Development Research Centre (IDRC). This community-based participatory research project has three main objectives.

DECODE's first objective is to support knowledge systemization to deepen collective understandings of how to address modern challenges (e.g., climate crises and persistent inequalities) and how local communities and/or Indigenous peoples are facing these challenges by drawing on local knowledge and co-creating solutions. The second is to contribute to the decolonization of knowledge and transform globally how community knowledge and community-driven solutions are recognized, co-constructed, and shared. Thirdly, DECODE aims to openly share knowledge through the development of case studies and global peer learning opportunities. Figure 1 provides an overview of The Decode Project's over-arching objectives.

Summary of DECODE's Objectives

1. Systemize existing community and/or Indigenous-led research practices and share lessons learned.

2. Facilitate peer learning opportunities to engage a broader network of people (e.g., civil society, researchers, policymakers, practitioners).

3. Create open access to knowledge through various platforms to support knowledge democracy.

Figure 1: DECODE's Objectives

DECODE's community-based participatory research approach emerged from thought leadership and social movements of the Global South and is supported by a knowledge democracy framework (Hall & Tandon, 2017; 2020; 2021; de Sousa Santos, 2015; Fricker, 2007; Tandon, Singh, Clover & Hall, 2016; Tandon, Hall & Lepore, 2016).

Why is DECODE's Approach to Community-Based Participatory Research Important?

Earth is facing multiple climate-related crises. DECODE aims to share lessons from community and/or Indigenous-led research initiatives and their approaches to addressing these modern challenges and developing climate resiliency. Climate scientists and communities are globally reporting the environmental and social impacts of these drastic climate changes. The United Nations (UN, 2015) and the International Panel on Climate Change (IPCC) (2022) reports show dire conditions around the world and that the sustainability of humanity is not guaranteed. To address the climate complexities facing society, the UN has called for new knowledge and partnerships with transformational power (UN, 2015). Cumming et al. (2018) reiterated that new approaches to sustainable development that include actionable solutions to climate crises and developing climate resiliency are required. In the 2019 Centre for Climate and Energy Solutions publication, *What is climate resilience, and why does it matter?,* climate resilience is described as "*the ability to prepare for, recover from, and adapt to*" (p. 1) climate change's significant and deleterious impacts. Climate crises (e.g., massive floods, fires, droughts, extreme storms, and other intense weather events) have been linked to economic models of continuous and rapid growth and expansions of gross domestic product (GDP) (Bakal & Einbinder, 2024). Efforts to continuously expand economic

growth and GDP have caused ecological disasters and natural resource destruction, impacting human health and resiliency (Bakal & Einbinder, 2024). Decolonizing and critical discourses (Van Dijk, 2015), along with community and/or Indigenous-led initiatives and projects, are emerging in the wake of dominant narratives, focusing on the transformative power of people and collective effort to address power inequities (Lepore, Hall & Tandon, 2024).

As part of its knowledge democracy framework, DECODE respects diverse knowledge cultures and intentionally welcomes collaborations with community-based research initiatives that involve art-based activities, land-based connections, and dialogue-based reflections that share understandings without depending on reading and writing practices (Clover, Sanford, & Harman, 2022).

DECODE's Community-Based Participatory Research Processes

This section outlines DECODE's community-based participatory research approach and key steps in developing six diverse case studies based on community and/or Indigenous knowledge.

Figure 2 provides an overview of the key steps: Partner Engagement, Data Collection, Sharing and Analyzing, and Knowledge Mobilization. Throughout DECODE's community-based participatory research processes, documentation, communication, and evaluation consistently occur.

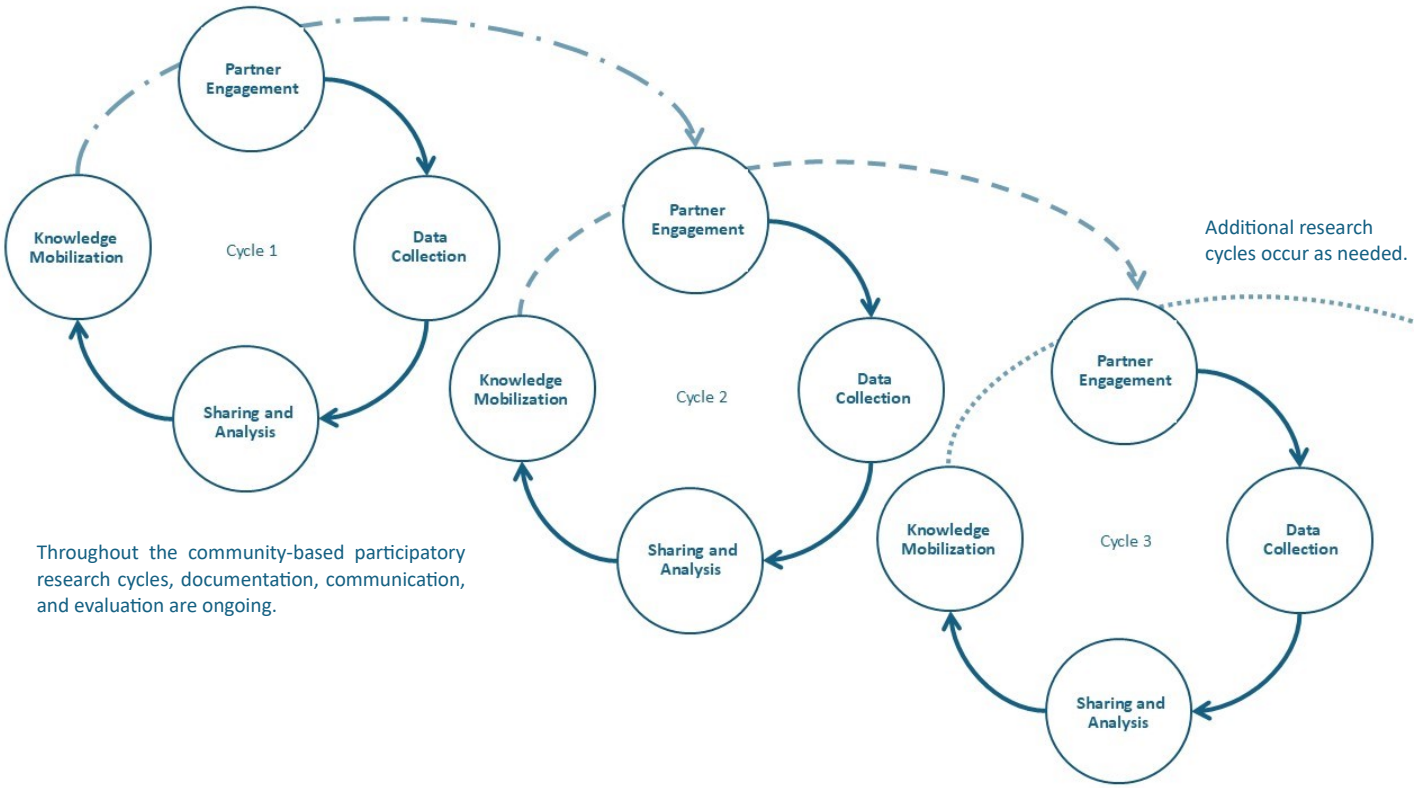

Figure 2: DECODE's Community-Based Participatory Research Process

Step 1: Partner Engagement

DECODE's initial step was to build relationships with key community-based research partners and establish trust that would support ongoing collaboration. To connect with potential partners, DECODE shared a call for collaboration across its global research network.

"We seek collaboration with global networks of community and Indigenous-led research practitioners with the aim to amplify locally contextualized actionable knowledge in addressing challenges identified by communities themselves. This project would deepen our understanding of principles, policy implications, and supportive infrastructures needed to further advance community and Indigenous-led knowledge movements."

Figure 3: DECODE's Call for Collaboration

The call focused on engaging potential research partners in three main ways, which included:

1. **Contribute to Change:** Shape the discourse around community and Indigenous-led research, contributing to a transformative future.
2. **Build Connections:** Connect with global practitioners, scholars, and community researchers, fostering a collaborative force for good.
3. **Support Knowledge Democracy:** Join the movement to democratize knowledge, ensuring diverse voices are heard and valued.

Several community-based research initiatives answered DECODE's call to collaborate, and each was assessed to determine alignment.

Assessment of Potential Case Studies for DECODE

To determine fit, Dr. Budd Hall and Dr. Rajesh Tandon (UNESCO Co-Chairs) assessed the potential collaborators' research projects. Three primary considerations guided their assessment, which were:

- Alignment with community-based participatory research approaches.
- Geographic representation from around the world.
- Community activities were focused on developing climate resiliency.

Based on the initial assessment, six community initiatives were chosen to collaborate with DECODE.

Establishing Regional Teams

Six regional teams were created to develop case studies. Each regional team included at least one:

a) Lead from the community-based initiative.
b) External partner (e.g., researcher).

Once regional teams were established, the Story Map platform (a tool for openly sharing community-based research activities) was introduced. DECODE's administrators followed specific steps to help guide regional teams in developing the case studies (i.e., Story Maps). Appendix A provides an overview of DECODE's administrative team's steps to support these initial collaborative efforts.

Step 2: Data Collection to Develop the Case Studies

DECODE's data collection goal for the regional teams was to comprehensively gather and analyze information related to the community-based research initiatives. Data collection methods discussed in this section include summarizes of:

a) Activities undertaken by the regional teams to comprehensively gather and analyze data related to the research projects to create a story map for each case study and
b) Community-based participatory research methods used within the community-based research initiatives to gather (collect), systematically organize (systematize), and share (disseminate) knowledge.

Gathering Community-Specific Data to Support the Development of Case Studies

Figure 4 outlines the data collection process that DECODE provided to regional teams to support the development of story maps for the case studies.

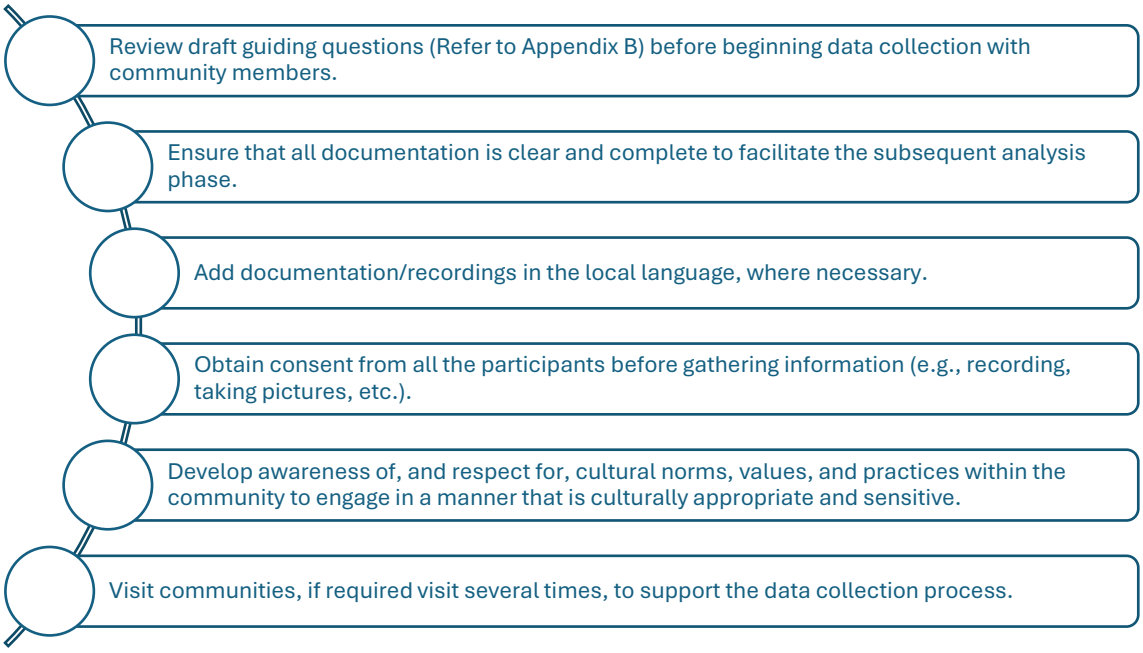

Figure 4: DECODE's Process for Regional Teams to Collect or Compile Data to Support Case Study Development

Compiling Community-Specific Data into Individual Case Studies and Story Maps

Once data was collected or compiled, each regional team collaborated to transform it into a story map. Story maps were meant to engage audiences and communicate information about community initiatives. To assist in creating the story maps, DECODE provided regional teams with guiding questions. Figure 5 provides examples of the guiding questions; refer to Appendix B for the complete list.

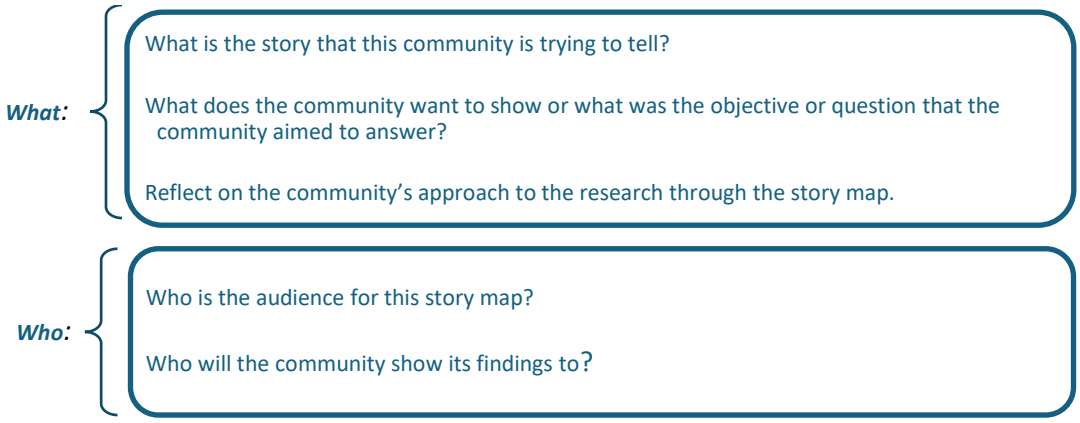

Figure 5: Guidance Questions to Support Story Map Development

Regional teams also integrated relevant background data (e.g., geographic, demographic), maps, visuals, reflections, and narratives into the story maps. As regional teams progressed in their work, DECODE's administrative team supported them via one-on-one discussions, group webinars, etc.

Step 3: Sharing of Data and Rounds of Discussion and Analysis

After the regional teams developed the Story Maps, rounds of participatory analysis generated preliminary findings from the community-based research projects, including an initial analysis of individual case studies by regional team members and a comparative analysis of all case study data.

Initial Analysis

The regional teams initially analyzed data from each case study. To support this initial data analysis cycle, DECODE provided the regional research teams with analysis questions. DECODE's initial analysis questions included:

- **Community Knowledge Exploration:** How does the community understand and recognize their inherent knowledge?
- **Knowledge Systematization:** Why and how did the community decide to systematize their knowledge?
- **Values of the Knowledge System:** What major values does the community consider integral to their knowledge system?
- **Benefit Sharing Discussions:** How were the discussions on benefit sharing held with those who supported the systematization of their knowledge?
- **Ownership of Knowledge:** How were the discussions on the ownership of knowledge developed?
- **Interaction with Academic Knowledge**:
  a) How did the interactions with academic knowledge take place? These could be outsiders from academia, funders, etc.
  b) Explore both the empowering and non-empowering aspects of these interactions.
- **Role of External Partners:** How did the external partners reach out to the community (or vice-versa) or learn about them and their knowledge?
- **Knowledge Validation:** How was knowledge validated throughout the process?
- **Multiple Uses of Knowledge:** How were the discussions on the multiple uses of knowledge conducted?
- **Impact Analysis:** Discuss the project's impacts on the communities and the partners involved.

These initial analysis questions helped to generate preliminary findings, refine the story maps, and enhance understanding of the community-based research initiatives.

Comparative Analysis

All data sources (e.g., initial analyses and story maps) were compiled to support a comparative analysis. Key team members Dr. Budd Hall, Dr. Rajesh Tandon (UNESCO Co-chairs), and Maeva Gauthier (a DECODE researcher) participated in the comparative analysis process, which involved reviewing the data to identify patterns, commonalities, differences, and emergent preliminary findings.

Review of Comparative Analysis and Community Partner Verification

In January 2025, a draft of the preliminary findings was shared by the DECODE team with the regional teams for review, feedback, and/or verification. All feedback provided by the regional teams to date was included in the preliminary findings found in this paper. As the DECODE project progresses and to maintain ongoing alignment with community-based participatory research processes, additional cycles of engagement, sharing, analysis, and verification of findings will be conducted.

Step 4: Knowledge Mobilization

The DECODE project will participate in knowledge mobilization in multiple ways. Both story maps and the preliminary findings within this paper will be shared with all community members and beyond through peer learning opportunities and global networks (e.g., Knowledge for Change Consortium). Knowledge mobilization will continue as materials are updated, new case studies are added, processes are refined, and analysis cycles are completed.

Mobilization of Case Studies

DECODE's case studies aimed to effectively document and disseminate findings from community-based research projects. Story maps were designed to be visually appealing and informative for people to learn from and help them easily access and understand diverse community perspectives and approaches to research.

Mobilization of Preliminary Findings

DECODE will continue to share preliminary findings with community members for further review, discussion, analysis, and/or verification by sending invitations to community researchers to review the papers independently or engage in peer learning opportunities. The UNESCO Co-Chairs and community researchers will host the webinar series to present and discuss the preliminary findings with community members and researchers.

DECODE Case Studies

Six diverse case studies were developed in response to the initial call for collaboration, and this section provides a brief introduction to each of the community-based research projects. Of note is that case studies are introduced chronologically based on their connection to the DECODE project. The case studies include:

Modernization of Apong Production: A collaboration occurred between local Apong harvesters (Penuak) in Sarawak, Malaysia, and researchers from the University of Malaysia Sarawak (UNIMAS) to modernize traditional Apong production by developing and using hybrid stoves. Penuak are the custodians of traditional Apong (palm sugar) production, an artisanal craft rooted in cultural heritage. This project preserved local knowledge and mangrove ecosystems while enhancing the economic and social empowerment of Penuak community members.

Figure 6: Malaysia

The Women's Cooperative: The Women's Cooperative, HARC—Alaknanda Krishi Vyavsya Bahuudeshya Swayat Sahkarita (HAKVBSS), located in Kelawar, India, engaged in sustainable agriculture and used traditional knowledge to produce high-value, wild edibles for the market. This community-based initiative empowered women, preserved traditional practices, and enhanced livelihood resilience against climate change.

Figure 7: India

Regenerating Acholi Traditional Knowledge: Regenerative practices helped to cultivate and share traditional Acholi knowledge, addressed climate change, and empowered women in Uganda. Acholi knowledge systems have also been integrated into Gulu University through a formal Herbal Medicine certificate program. The partnership between the university and local herbalists bridged traditional and scientific knowledge and encouraged regenerative practices, community-based healthcare, and educational capacity.

Figure 8: Uganda

Guardians of the Forest: Located in the Putumayo region of Columbia, the program's objectives focused on training and empowering women from three Indigenous communities (e.g., Emberas, Yanakonas, and Pastos). The Guardians of the Forest project connected community members to their local knowledge and recognized the value of the territory, native plants, and conservation.

Figure 9: Columbia

Nanuk Narratives: This project showcased community members' voices from Nunavut, Nunavik, Nunatsiavut, and Greenland by exploring the connections between Inuit and Polar bears in the Davis Strait region of the Arctic. Through a film series, diverse, multi-generational experiences and Inuit knowledge were shared. Inuit stories offered unique perspectives on how polar bears were woven into life's cultural and ecological dimensions, highlighting the challenges and stewardship practices that have sustained this enduring bond.

Figure 10: The Arctic

Using Indigenous Research to Plan for Future Pandemics: During the COVID-19 pandemic, research team members engaged directly with both the Tl'etinqox and Qwelminte Secwépemc communities through a series of capacity-building workshops informed by Indigenous research methods. The research focused on how the COVID-19 pandemic and its associated restrictions exacerbated the impacts of climate change on the health and well-being of Indigenous peoples in Tl'etinqox and Qwelmínte Secwépemc Nations in central British Columbia, Canada.

Figure 11: Western Canada

Individual Case Study Data Collection, Knowledge Systematization and Knowledge Dissemination Processes[1]

Although all case studies aligned with community-based participatory research approaches, the specific activities (i.e. research methods) used to gather (i.e. collect), share and systematically organize (i.e. systematize) or distribute (e.g., disseminate) knowledge varied widely. The following sections provide insights into each case study's data collection, knowledge systemization, and dissemination processes.

Modernizing Traditional Apong Production in Samarahan: Empowering Penuak (Apong Harvesters) in Sarawak (Malaysia)

The Apong Modernization Project is a community-based research project in the Sarawak region of Malaysia that contributed to modernizing the Apong industry by blending traditional practices with modern technology. Table 1 summarizes the approaches used for data collection by regional team members to gather data for the story map and by community members and external partners to share, systematize and disseminate knowledge.

Table 1: Community-Based Participatory Research Approaches - Malaysia

Regional Team's Data Collection Activities	Sharing and Systemization of Knowledge by Community	Dissemination of Knowledge
1. In-person interviews with Apong Harvesters. 2. Photographs. 3. Personal reflections and narratives of regional team members.	1. Interviews with Penuak. 2. Visual storylines about the history of Apong harvesting and processing. 3. Step-by-step process used to harvest and process Apong. 3. Field trials of stove prototypes and Apong nectar production techniques, feedback loops, continuous dialogue, observational visits, and evaluations to determine which modern techniques or technologies worked well with traditional practices. 4. Establishment of Samarahan Apong Collective for decision-making and ongoing activities. 5. Community events, gatherings, and observations.	1. Community events, gatherings, and the Samarahan Apong Collective. 2. Narrative storylines, processes, and visuals (e.g., photos, videos, and illustrations). 3. Participation in DECODE and the development of the case study.

Data Collection for the Case Study - Malaysia

In Malaysia, community researchers focused on conducting in-person interviews and creating arts-based storylines (chronological narratives) with Penuak (Apong harvesters). Three Penuak participated in developing visual story timelines for the case study. Edi, Nasir, and Sabli shared their stories, including familial histories, cultural connections to Apong harvesting, and techniques learned over multiple generations. Their narratives and storylines provided insights into several events or transition points in their collective journeys, including the creation and participation in the Samarahan Apong Cooperative and the inclusion of modern processing and marketing techniques to develop and share Apong-based products while balancing the preservation of "*Sarawak cultural and economic heritage.*"

Traditional Practices of Penuak for the Harvesting /Processing of Apong:

1) Daily harvesting to sustain sap flow.

2) Stewardship and use of exclusive Apong areas by each Penuak.

3) Practices to preserve Nypa palm to maintain a continued source of income.

4) Selective harvesting to balance immediate needs with quality and health of the trees.

Figure 12: Traditional Penuak Processes

The interviews also collected data on traditional practices related to harvesting and processing Apong (Refer to Figure 12), highlighting the importance of sustainable stewardship and the ongoing protection of mangrove ecosystems. Along with conducting interviews with Penuak, community researchers provided personal reflections on their participation in the Apong Modernization Project. Their reflections focused primarily on providing an overview and discussing the project's outcomes and

[1] Additional details related to data collection processes can be accessed by reviewing each case study's Story Map.

implications. Images of the story timelines, an informational video on Apong harvesting, photographs of participants and research activities, and informational figures (e.g., stakeholders involved in the Apong Modernization Programs and research processes) supported the information provided through the interviews and reflections, highlighting the diversity of the participants and activities within this community-based research initiative.

Systematization of Traditional Penuak Knowledge

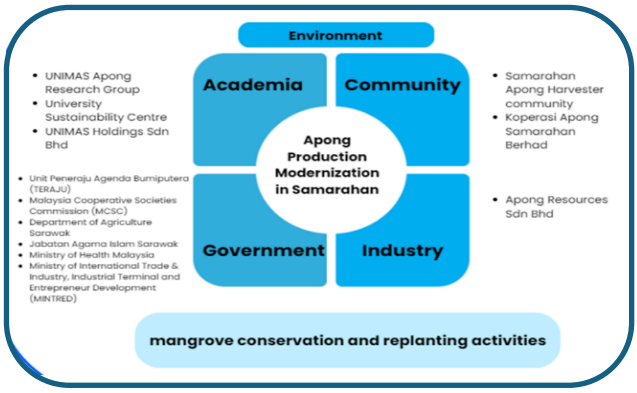

Figure 13: Apong Modernization Project Participants

The Apong Modernization Project included the collaborative efforts of over one hundred people, including Penuak, UNIMAS researchers, funders from (Dana Pembangunan Bumiputera – DPUB), and government agencies (Figure 13). As it was a community-based research project, Penuak actively participated in the research, including all design and decision-making processes. The project focused on respecting community voices and expertise while learning how to integrate modern technologies in the production of Apong nectar.

Community meetings, village-based events, workshops, and cooperative working sessions were held to explore diverse applications of harvesting and processing related to Apong resources. During community meetings and events, harvesters shared the challenges of traditional harvesting methods (e.g., length, labour-intensive work in difficult and dangerous conditions). Community members also participated in field trials of stove prototypes and Apong nectar production techniques, feedback loops, continuous dialogue, observational visits, and evaluations that occurred to create the outcomes for the project, which supported decision-making by Penuak communities related to stewardship of mangrove forests and the harvesting and processing options for Apong.

Current Options for Penuak Related Apong harvesting and processing:

1) Continuing traditional practices of harvesting and processing,

2) Participating in the Apong Harvesting Cooperative's processing centre, and

3) Participating in a combination of modern and individual production.

Figure 14: Current Options for Penuak

Knowledge Dissemination - Malaysia

Knowledge was disseminated through community gatherings, events, word of mouth, Apong Collective activities, photographs, storylines, figures, and involvement in the DECODE project.

Pahadi Karmat aur Jhujara Mahilaye - Himalayan Hardworking Women: The Women's Cooperative (India)

The Women's Cooperative is a community-based research project from Kelawar, India. It was established through a network of Self-Help Groups (SHGs) to pool *"resources, knowledge, and support*," develop procurement processes for local resources (e.g., wild berries, fruits), and conduct comprehensive training programs for local women. Training programs focused on various topics ranging from harvesting and processing to packaging and marketing skills. Its research and development program supported collaborative efforts between The Women's Cooperative members and external partners (e.g., scientists and engineers). Table 2 provides an overview of their community-based participatory research approaches.

Table 2: Community-Based Participatory Research Approaches - The Women's Cooperative

Regional Team's Data Collection Activities	Sharing and Systemization of Knowledge by Community	Dissemination of Knowledge
1. An external researcher wrote the narrative. 2. Reviewed documentation for regional, cultural, and geographic information. 3. Conducted in-person visits to the region and site of the collective. 4. Workshop held with local women provided their reflections and insights on the narrative. 5. Informal conversations with women and Collective members occurred. 6. Arts-based approaches included: Photography, videos, development of a visual of the Collective's membership model, and audio recordings.	1. Self-help groups. 2. Scoping studies focused on distribution, production, and traditional knowledge of wild produce. 3. Interviews with women and key informants (e.g., agriculturalists) 4. Identification of wild resources (e.g., berries/plants). 5. The Women's Collective. 5. Cooperations with technical agencies supported the customization of "*technologies, processes, product trials, and improved storage*." 6. In-house research trials for various product development, including testing and analysis rounds. 7. Finalization of systems and products for certification (by the Uttarakhand State Organic Certification), packaging, marketing, and distribution.	1. The Women's Cooperative operations and meetings. 2. Community gatherings, workshops, and word of mouth. 3. Participation in DECODE and the development of the case study. 4. Marketing materials and products.

Data Collection for the Case Study - India

Part of this case study was situating The Women's Cooperative geographically, ecologically, and culturally within the mountains of the Uttarakhand region and Chamoli District of India. The external researcher described the region's connection to nature and provided an overview with photos of specific wild edible plants at the heart of the cooperative's activities. Following this overview, the external researcher used a narrative to introduce the community-owned women's enterprise (HARC – Alaknanda Krishi Vyavsya Bahuudeshya Swayat Sahkarita (HAKVBSS). The narrative highlighted how The Women's Cooperative combined women's traditional knowledge to transform wild produce with modern techniques into marketable products for consumption. The introduction provided insights into traditional knowledge, contemporary techniques, equipment, and training used by The Women's Cooperative to develop their products.

In addition to the narrative of The Women's Cooperative and its processes, the researcher included personal reflections on her visit to Jilasu. She described the in-person interviews and interactions with local women. According to her reflections, the in-person visit, informal conversations, and interactions with community members helped to deepen the researcher's understanding of The Women's Cooperative. During the visit to the village, the researcher brought an initial narrative (written off-site in Delhi) and engaged the local women through a workshop at the cooperative to review it and help fill in gaps in understanding. A visual was also created during the workshop to illustrate the Women's Cooperative's two membership tiers and support the development of a deeper understanding of their membership model. Photographs, videos, and audio recordings were taken and supported the narrative, illustration, and personal reflections for the case study.

Systematization of Knowledge by The Women's Collective

As part of the community-based research initiative, local women, community members, and external partners systematically gathered traditional knowledge alongside modern research and development techniques to create valuable products for The Women's Cooperative to produce. Figure 15 lists community-based participatory data collection activities that The Women's Cooperative participated in to systematically share their knowledge and develop new products for markets.

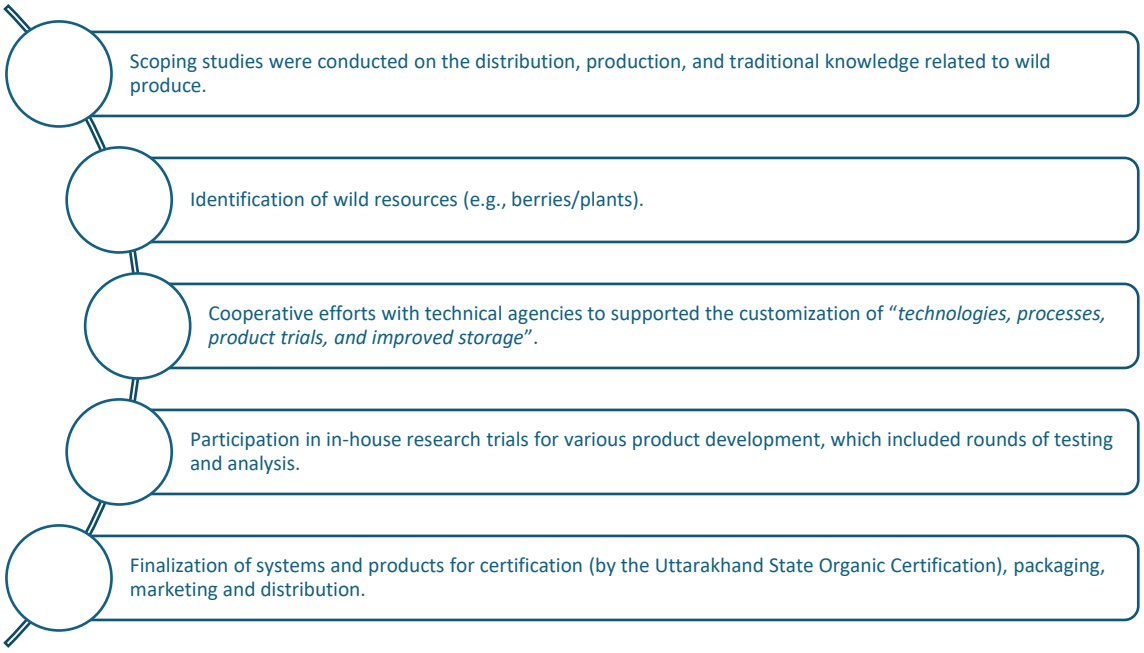

Figure 15: Data Collection Processes of The Women's Cooperative - India

Knowledge Dissemination - The Women's Cooperative

The Women's Cooperative distributed knowledge informally (e.g., word of mouth, events, gatherings, tourism) and formally (e.g., meetings, the research and development program, training programs, and through the marketing and distribution of the products themselves). Participating in DECODE and developing the story maps were additional forms of knowledge dissemination for The Women's Cooperative.

Regenerative Acholi Traditional Knowledge (Uganda)

The Regenerating Acholi Traditional Knowledge is a case study of a community-based research project located in Gulu, Uganda. Through the Wise Women of Gulu program, regenerative practices helped to cultivate and share traditional Acholi knowledge, address climate change, and empower women. Table 3 lists community-based participatory research approaches used to support this research initiative.

Table 3: Community-Based Participatory Research Approaches - Uganda

Data Collection for the Case Study	Systemization of Knowledge	Dissemination of Knowledge
1. Interviews with community lead Julie Adoch (Miss Julie). 2. Geographic and census data. 3. Personal narratives of external researchers. 4. In-person visits to the community. 5. Interviewed program participants, beneficiaries, and community members. 6. Videos, photographs, and audio recordings.	1. Intergenerational knowledge transmission. 2. Across time and space (e.g., timescape activity captured this component). 3. Guided discussions. 4. Community gatherings (e.g., site visits, ceremonies). 5. Experiential learning opportunities. 6. Participating in traditional stewardship or healing practices. 7. Development of written documents and training programs. 8. Creation of formal partnerships (e.g., university researchers, NGOs, experts).	1. Intergenerational knowledge transmission. 2. Spirituality. 3. Word of mouth 4. Communications by local Chiefs. 5. Radio broadcasts. 6. Awareness and advocacy campaigns. 7. Training programs. 8. Community gatherings and conversations. 9. Collaborations with university (e.g., Herbal Medicine Program). 10. Participation in DECODE and the development of the case study.

Data Collection for the Case Study

Two regionally based researchers interviewed Juliette Adoch (Miss Julie), a community leader and the founder of Wise Women of Uganda, to support the development of the case study. They also made several in-person visits to sites of the Wise Women of Uganda's activities, where gatherings, discussions, training, healing, and/or regenerative practices occurred. The external researchers met with program participants, observed training, and visited local sites and homes of program beneficiaries who had land or gardens changed by the Wise Women of Uganda's efforts. During these visits, interviews were conducted with participants, local community members, and beneficiaries to understand their perspectives on the program. With Miss Julie's guidance, they participated in community dialogues on environmental problems in Gulu, and gathered photographs, videos, audio recordings, geographic and demographic data.

Systematization of Knowledge - Uganda

The systematic sharing of knowledge in Uganda has occurred throughout history via intergenerational and ancestral transmissions, spirituality, across time and space (timescapes), word of mouth, experiential learning, community gatherings, healing, and stewardship practices. During one session with program participants, Miss Julie and the group collectively mapped out a timeline and landscape (a timescape) of the Wise Women of Uganda's activities. This timescape activity included the sharing of emotions and experiences of program participants and their perspectives on the future. Additional forms of knowledge systematization identified by the Wise Women of Uganda included site visits, written documentation, guided discussions, and formal partnerships with external parties (e.g., university researchers, non-governmental organizations (NGOs), and experts).

Guided discussions between a community leader (e.g., Miss Julie) and program participants also supported knowledge systematization. These discussions were held in person and on the land and focused on addressing environmental problems and finding practical solutions. Discussions often explored traditional regenerative processes for land and tree species, which included planting native trees and protecting young trees. Regenerative traditional knowledge was directly connected to the regeneration of Indigenous trees and their uses, which is why the community-based research and training programs focused specifically on tree identification, tree management and care, and the sharing traditional uses (e.g., medicinal, and cultural).

Knowledge Dissemination - Uganda

Methods used for knowledge systematization and sharing also supported knowledge dissemination by program participants and external parties. Dissemination of knowledge about the program, recruitment to training programs, and/or its advocacy efforts to broader audiences occurred through the communication of chiefs, radio broadcasts, established partnerships, community engagement and awareness campaigns, training programs, spiritual practices, community gatherings, conversations, and word of mouth (e.g., through beneficiaries and community members), etc. As other communities learned of the Wise Women of Gulu's regenerative practices, it expanded and became the Wise Women of Uganda. Traditional Acholi knowledge was also integrated into Gulu University through a formal Herbal Medicine certificate program. This partnership between the university and local herbalists bridged traditional and scientific knowledge while supporting regenerative practices, community-based healthcare, and educational capacity.

Guardians of the Forest Project (Columbia)

This community-based research project included members from three communities in the Putumayo region of Columbia. The Guardians of the Forest program focused on training and empowering local women by sharing and validating their local knowledge and collectively recognizing the value of their culture, territory, native plants, and conservation efforts. Table 4 overviews the community-based approaches used to support this project.

Table 4: Community-Based Participatory Research Approaches - Columbia

Data Collection for the Case Study	Sharing and Systemization of Knowledge by Community	Dissemination of Knowledge
1. Community gatherings. 2. Territory tours. 3. Informal (e.g., shared meals) and formal conversations (e.g., workshop, and introductions). 4. Group discussions. 5. Personal reflections of external researcher. 6. Photographs and audio recordings.	1. Harmonizations (i.e., ceremonies with spiritual elders, medicines, burning tobacco, music) 2. Territory tours included identifying species and sharing knowledge along a particular route. 3. Heartbeat timeline (i.e., visual, and emotional representation of participation in the program). 4. Social cartography (i.e., visual collective representation of routes within the territory and knowledge connected to them).	1. Informal (e.g., bonfire, meals) and formal (e.g., harmonizations, workshops) gatherings. 2. Territory tours. 3. Knowledge exchange (e.g., communities, generations, scientists. 4. Visuals (e.g., heartbeat timeline and maps). 5. Participation in DECODE and development of the case study.

Data Collection for the Case Study and Knowledge Systemization Methods - Columbia

The regional team reflected that the Guardians of the Forest program had three main phases that supported knowledge sharing and systematization; however, it was through participation in DECODE, that the Guardians of the Forest program participants formally documented their community knowledge and created illustrations (a heartbeat timeline and social cartography map).

The first "theoretical" phase of the Guardians of the Forest Program involved workshops and discussions between members of three local communities and forestry professionals. The second phase focused on collectively shared spiritual ceremonies (e.g., harmonizations), land-based activities (e.g., tours), and/or arts-based practices (e.g., photography). This phase started with welcoming guests to the territory, shared meals, harmonizations led by spiritual elders (with music, chanting, and burning of incense/tobacco), and individual introductions of participants (e.g., presentations provided in a circle). The project's third phase is ongoing and focused on intergenerational knowledge sharing. It replicates activities from phases one and two with children (guaguas) from the communities to train them as younger generations of Forest Guardians.

Within phase two, external researchers (i.e., a facilitator and a photographer) visited a community and participated in various community-based research activities. For example, the external researchers supported the creation of an art-based timeline of the program (i.e., the heartbeat timeline). The heartbeat timeline was a key method used by community members to support data collection, knowledge systemization, and dissemination. This activity activated participants' memories and formed timelines of their experiences. It included the highs and lows of the process, resembling a heartbeat. Figure 16 describes the activities used to create the heartbeat timeline.

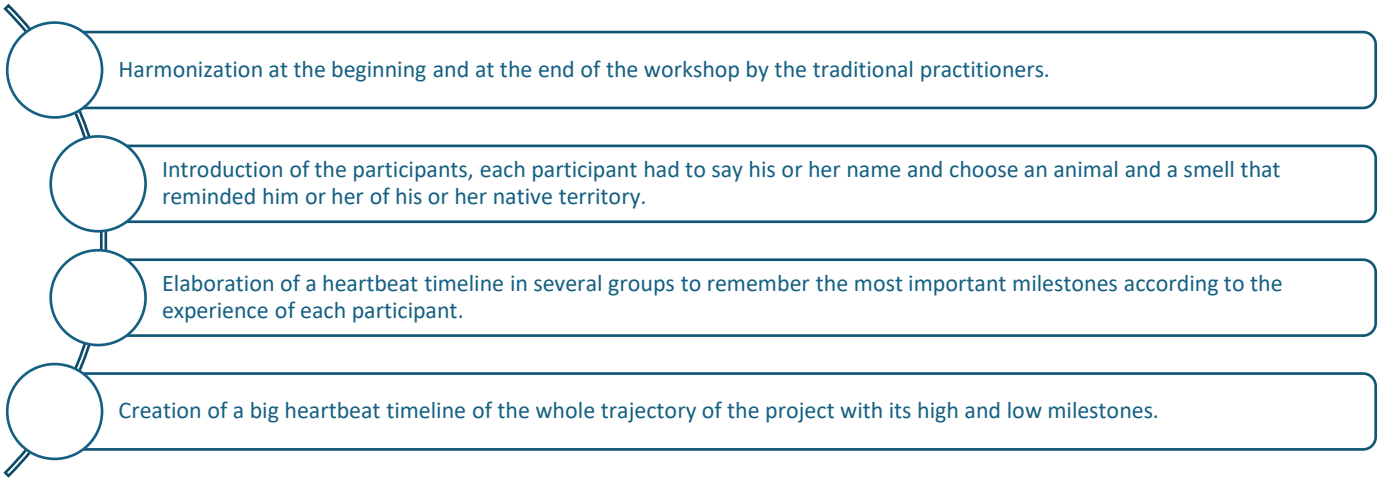

Figure 16: Heartbeat Timeline Process

The external researchers also gathered with participants informally (e.g., around a fire and shared experiences, knowledge, and traditional drinks (e.g., Chicha)), participated in territory tours, ceremonies/rituals, and conducted a social cartography exercise. For the social cartography exercise, the group created a map of the route they had travelled together. On the map, community members placed the routes they had travelled in the territory and shared their knowledge of the routes. Through the sharing and systematization of their knowledge, local women validated their knowledge by sharing their travelled routes and knowledge in this way and established themselves as guides and Guardians of the Forest.

Knowledge Dissemination – Columbia

The Guardians of the Forest program emphasized that informal, unplanned knowledge-sharing and dissemination methods occurred during in-person connections. Through informal conversations, such as gathering around a fire, "*stories, anecdotes, recipes are shared, and trust among all is strengthened,*" (Columbia). Structured group activities (e.g., harmonizations, territory tours, and workshops) also supported knowledge exchanges with other communities and forestry professionals. Through participating in the DECODE Project and developing a case study, external researchers assisted community members in the creation of visual representations of their knowledge and experiences (e.g., the heartbeat timeline and social cartography activities), which could be replicated and shared amongst community members, particularly with the younger generations, and beyond without relying on written words to convey meaning. Marks made on the map, highlighted well-travelled routes, important species and their uses, and places of rituals.

Nanuk Narratives (Arctic)

Nanuk Narratives is a case study of a community-based research project focused on Inuit knowledge of polar bears and related practices from communities across the Davis Strait region. Through the voices of community members (e.g., seasoned hunters, respected Elders, cooks, and youth) from Nunavut, Nunavik, Nunatsiavut, and Greenland, the film series captured the diverse, multi-generational experiences and knowledge related to this human-animal relationship. Table 5 overviews the community-based approaches used to support this project.

Table 5: Community-Based Participatory Research Approaches - The Arctic

Data Collection for the Case Study and Nanuk Narratives	Sharing and Systemization of Knowledge by Community	Dissemination of Knowledge
1. Regional team members (part of the Torngat Secretariat) provided documentation and personal reflections on the Nanuk Narratives project. 2. Western science methods: Surveys and population studies of polar bears. 3. Interviews with community members. 4. Direct observations. 5. Interviews with community members. 6. Film and photography. 7. Inuit Knowledge studies.	1. Storytelling, oral histories, conversations. 2. Experiential land-based learning and direct observation. 3. Inuit Knowledge studies. 4. Community, particularly multi-generational gatherings. 5. Creation of the film series. 6. Online course development (including reflection questions, written summaries, etc.). 7. Participation in co-management, co-governance and working groups with external parties.	1. Experiential land-based learning. 2. Storytelling and oral histories. 3. Community gatherings (e.g., film screenings). 4. Land-based multi-generational knowledge exchanges for cultural continuity. 5. Distribution of films. 6. Visuals, including posters and infographics. 7. Open access to online courses. 8. Ongoing work by working groups, co-management, and co-governance boards. 9. Informing policies and strategies related to co-management. 10. Social media. 11. Classroom education kits. 12. Participation in DECODE and the development of the case study.

Data Collection for the Case Study

The regional team, including members of the Torngat Secretariat, reviewed, and reflected upon the materials created for and through the community-based participatory research processes of the Nanuk Narratives and related programs. Data collected for the case study included geographic, relationship, and cultural information, which established the importance of the nanuk (polar bear) for Inuit communities throughout the Arctic. Maps and photographs of various regions (i.e., Nuuk, Greenland; Pangnirtung and Iqaluit, Nunavut, Canada; and Kangiqsujuaq, Kangiqsualujjuaq, Inukjuak, and Rigolet, Nunavik, Canada) were also included. The case study also outlined working relationships and agreements in the region (e.g., land claims) between Inuit communities and other entities (e.g., provincial, territorial, and federal governments and co-management boards).

Data Collection for Nanuk Narratives

Over several years (2022-2024), the Interdisciplinary Working Group held meetings virtually and attended one in-person meeting at the ArcticNet Conference (2022). During these meetings, information on challenges related to nanuk, particularly the Davis Strait subpopulation, was gathered from various groups and organizations (e.g., the Davis Strait 2017-18 survey team, the Polar Bear Advisory Committee, the Polar Bear Technical Committee, the Nunatsiavut Government; Makkivik Corporation, and the Nunavut Wildlife Management Board). While various perspectives were shared throughout these meetings, the Interdisciplinary Working Group identified the need for collective Inuit knowledge that was accessible and could inform decision-making and policy. Documentary films and visual media (e.g., photographs) were viewed as valuable and culturally appropriate tools to support the collecting and sharing of Inuit Knowledge throughout the region. The project also gathered available data from Western scientists, including information from a mark-recapture study, two subjective estimate studies, and two structure population studies. Western science data was summarized into informational posters with maps, infographics, and imagery to share or disseminate recent polar bear population changes, geographic information, research techniques, and results. Extensive teams of Inuit community members and Western scientists conducted aerial field surveys and biopsy mark-recapture methods to understand the current conditions of nanuk.

Knowledge Systematization

Systematic knowledge sharing has occurred throughout Inuit history via multi-generational experiences and oral histories. For the Nanuk Narratives project, interviews and filmmaking helped to convey Inuit Knowledge related to nanuk (Polar bears) and shared the voices of community members from Nunavut, Nunavik, Nunatsiavut, and Greenland (e.g., traditional language speakers, seasoned hunters, respected Elders, cooks, and youth). The film series was chosen as a culturally appropriate medium through which Inuit knowledge (e.g., stories, audio, and visuals) could be systematically shared and distributed. The film project also focused on connecting youth with elders and interviewing elders about their deep understanding of nanuk. The films captured Inuit place-based knowledge, which included information on nanuk behaviour, habitat, ecology, seasonal patterns, movements, hunting habits, and interactions with other species (e.g., humans). Filmmakers who supported the project were from local communities within Nunavut, Nunavik, Nunatsiavut, and Greenland. It was essential to the filmmaking and data collection processes to have local filmmakers as they brought "*a deep understanding of cultural nuances, community dynamics, and traditional storytelling methods, which is essential for creating content that resonates with Inuit audiences while also educating external audiences.*" Another part of knowledge systematization for this project was youth involvement in the filmmaking and review process. Over forty youth shared their reflections on the twenty videos and how to support cultural continuity in their communities moving forward.

Inuit knowledge studies from Nunavut, Nunavik, and Nunatsiavut also shared insights into nanuk populations, distributions, ranges, and human interactions. Land-based activities supported the gathering of Inuit place-based knowledge of the nanuk, which highlighted the ongoing intergenerational transmission of knowledge and how firsthand and generational knowledge was gained over time through direct observations, storytelling, oral traditions, holistic, cultural, and ethical considerations interactions, and stewardship of Inuit homelands.

Knowledge Validation and Dissemination – The Arctic

The Nanuk Narratives involved collaborative decision-making and knowledge co-creation between Inuit leaders, the Interdisciplinary Working Group, co-management board participants, hunter and trapper organizations, Elders, hunters, youth, and filmmakers. Through creating Inuit knowledge films (from conducting and filming interviews to editing and storytelling), the research project focused on aligning narratives with the values and lived experiences of the community members participating and informed decision-making processes. Ongoing engagement to support alignment occurred, including film screenings across the Davis Strait region, including Nunavut, Nunavik, and Nunatsiavut communities. There were additional opportunities for review, feedback, and revisions by film participants and other community members to ensure that content was *"relevant, accurate, and meaningful to the people whose stories*" were being shared and amplified.

"Knowledge was validated through a multi-layered approach that prioritized community involvement, collaboration, and ongoing feedback. First, several Inuit Knowledge holders were directly involved in the Interdisciplinary Working Group, which supported their guidance in the conceptualization phase of this work. Additionally, the co-management boards played a key role in verifying and guiding the process, ensuring that the knowledge shared by community members aligned with cultural values and practices. Additionally, a participatory approach to filmmaking allowed for continuous input from community members during the production phase, with opportunities for feedback on drafts and final edits. This iterative process of validation, where knowledge holders could review and shape how their stories were told, ensured that the final outputs were reflective of the experiences and understandings of the communities involved. Finally, individual and community screenings were held so that those involved in this work could provide direct feedback and input on the content before it was shared externally." (Nanuk Narratives)

An informative film, *The Making of Nanuk Narratives,"* was also created and distributed to inform community members of the project's process. In addition to the films, a freely accessible online course, *Inuit Knowledge of Nanuk,* was designed for non-Inuit researchers and policymakers to *"deepen their understanding of the intricate relationships between communities and polar bears*." The Torngat Secretariat also used social media to share Inuit Knowledge and distribute information from Nanuk Narratives and related initiatives. Through social media, the team amplifies the importance of Inuit knowledge and impacts of co-management strategies on polar bears more broadly.

Using Indigenous Research to Plan for Future Pandemics (Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation)

This community-based research project was part of ongoing relationships between members of two First Nations (e.g., Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation) and external partners. Community members gathered and drew on Indigenous Research Methods to better understand the impacts of climate change and the COVID-19 pandemic in their territory and community-

led solutions to address them. Table 6 provides an overview of the Indigenous Research Methods and community-based participatory research approaches which were part of this project.

Table 6: Indigenous Research Methods and Approaches - Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation

Data Collection for the Case Study	Sharing and Systemization of Knowledge	Dissemination of Knowledge
1. Regional team members provided documentation and reflections on the project. 2. Photographs. 3. Indigenous Research Methods (e.g., informal conversations, reflections, storytelling, gatherings).	1. Community gatherings. 2. Direct observations and lived experiences. 3. Experiential learning. 4. Creation of a 10-year health plan. 5. Long-term relationships. 6. Formal agreements (e.g., Memorandums of Understanding) 7. Storytelling 8. Training programs and internships for students. 9. Intergenerational experiences. 10. Capacity building workshops. 11. Indigenous Research Methods course. 12. Communication tools: Website, newsletter, social media. 13. Aboriginal Rights and Title documentation.	1. Community gatherings. 2. Communication tools (e.g., newsletters, websites). 3. National and international events and gatherings. 4. Recommendations were sent to, and engagement occurred with government representatives from provincial and federal ministries. 5. The 10-year health plan. 6. Ongoing relationships and agreements. 7. Assertion of Aboriginal Rights and Title. 8. Government-to-government communications. 9. Participation in DECODE and development of the case study.

Data Collection for the Case Study

Researchers from Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation case study reviewed and reflected upon the materials created for and through community-based research processes undertaken to develop health plans and recommendations within their communities regarding the impacts of climate change and COVID-19.

Indigenous Research Methods Used by Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation

Data collection for this project occurred with community members of Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation and external partners. An Indigenous Research Methods course was co-designed by research team members and taught online and within the community, which helped inform the overall research process. The research project was also aligned with the United Nations Declaration on the Rights of Indigenous Peoples, recommendations from the Truth and Reconciliation Commission, Ownership, Control, Access, and Possession (OCAP) principles regarding intellectual property, and a Memorandum of Understanding between Tk'Emlups te Secwépemc and Thompson Rivers University (TRU), and a Memorandum of Understanding between Tŝilhqot'in National Government and University of British Columbia (UBC). Depending on the circumstances and cultural aspects of each First Nation, the specific Indigenous Research Methods used varied throughout the study.

"For example, several diverse community-based issues drove decision-making in both nations. What that meant was that interviews were dependent on weather and travel in the territories and different cultural and social issues impacting the families, whether it was wagon trips, funerals, births, or other community events. Those issues had a significant impact on how and when research could be scheduled. The researchers learned to work in and around various events. Similarly, the research could benefit from these events. For example, if there was a scheduled national government forum, the researchers could set up booths to talk about their work with community members and leaders in a familiar community-based setting." (Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation Case Study)

As part of the community-based participatory research processes, research teams engaged with community members through capacity-building workshops. Tl'etinqox and Qwelminte Secwépemc community members led the research, from designing and conducting the research to evaluating outcomes and disseminating findings, ensuring all processes were culturally appropriate. Community leaders created the research questions, guided how and what kinds of questions should be asked. The primary question

became, *"What issues, concerns and solutions do you have regarding climate change and COVID?"*. For this project, Indigenous research methodology was blended with a strengths-based approach.

Knowledge Systematization – Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation

Community members shared issues, solutions, and responses related to "*wildfire, water, climate change and COVID-19"* in various ways (e.g., gatherings, interviews, discussions, and workshops), and research team members documented what was communicated along the way. In May 2024, an in-person research gathering was held at Echo Valley Ranch. Gathering participants included Elders, fluent speakers, knowledge keepers, hunters, youth, and researchers. Informal interviews were conducted to support participants in "*feeling comfortable to speak freely about what's needed*." Throughout the project, some interviews were conducted in the Tŝilhqot'in language, some were conducted one-on-one, and others through sharing circles. As part of the research processes, community members developed recommendations for addressing the impacts on community health and well-being from climate change and the COVID-19 pandemic. Data gathered throughout the project and gatherings were brought to an analysis group, which included student participants. Youth and student involvement was central throughout the research, and the research team provided opportunities for young people to learn, develop skills, and connect with government internships and programs.

Knowledge Dissemination – Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation

After the data was analyzed, findings were presented by research team members, including youth, back to the communities and at various international gatherings. Part of the dissemination process included acting on the recommendations made by community members, which involved follow-ups with inter-university research collaboration grants, and provincial and federal ministers interested in climate change, and inviting government stakeholders to decision-making tables to learn from community-based knowledge and change policies.

Preliminary Findings

Preliminary findings have been split into two overarching and interconnected sections (Refer to Table 7 for an overview of each section and supporting research questions). Section one focuses on what the DECODE case studies reveal about research processes. Section two helps to deepen collective understandings of community and/or Indigenous knowledge related to addressing modern challenges (e.g., climate issues and developing climate resiliency).

Table 7: Overview of Preliminary Findings, Emergent Themes, and Related Research Questions

Section	Emergent Themes	Related Research Questions
1) Research Processes: What do the case studies reveal about community research processes?	Beginnings	What initiates/triggers interest in community-based participatory research processes?
	Early Interactions with External Experts	How do interactions with other external experts happen/occur?
	Knowledge Systematization	How was knowledge systematized within each of the case studies?
	Research Methods	a) Which methods were used in the case studies? b) Which of the methods used were purpose-linked or enabled community agency?
	Knowledge Mobilization and Uses	How was knowledge mobilized and used by the community and others?
2) Community Knowledge Insights: What do the case studies reveal about community knowledge cultures?	Deepening Our Understanding of Community Knowledge, Its Meanings, and Culture	What is community knowledge, and what are the values attached to it?
	Establishing Relationships of Trust: Partnerships Over Time	How does the research process build relationships with partners over time?
	Investing in Community Capacity	What does capacity building of community members mean within the contexts of the case studies?
	Supporting Co-Management	What are the governance structures which emphasize co-management with communities?
	Identifying Gender Issues: Women at the Centre	What are the gender issues at the centre of the research?
	Connecting With Future Generations	How does this work impact future generations of these communities and foster better relations with them?
	Acknowledging Cultures are Dynamic and Changing	How have traditional knowledge and scientific knowledge come together to keep cultures dynamic?

Section One: Community-Based Participatory Research Processes

Preliminary findings related to community-based participatory activities and research processes from the case studies are shared in this section.

Beginnings: What initiates/triggers interest in community-driven participatory research processes?

Stemming from informal and casual interactions with external academically trained experts, several community leaders developed ideas for undertaking systematic research on issues that concerned them. The purposes of enquiry and knowledge systematization in community-driven research focused on addressing the communities' current and practical needs.

Community-based research initiatives were driven to solve practical needs and improve current situations. For example, in Malaysia, the collective of Apong harvesters wanted to maintain the ecological balance of the mangrove ecosystems while improving the quality of their palm production and reducing the physical hardship of processing. For local women in the Himalayas, sustaining and enhancing livelihoods while dealing with climate impacts on local vegetation inspired their collective action. Meanwhile, in Uganda, initial interactions between a female community leader (Miss Julie) and experts from an international NGO inspired her to conduct community-based participatory research on local herbal plants. Through the initiative, Miss Julie wanted to encourage local women to:

a) Join a regenerative movement focused on herbal plants and
b) Enhance their knowledge and care for the herbal plant species.

"[There are] three major categories that are interconnected: Territory; women and spirituality. The problem that encompasses [all] three concepts is violence… indigenous communities have experienced violence towards their territory, not only because of deforestation and other climatic issues but also because of the internal armed conflict in the country that has caused many indigenous people to be displaced from their territory. On the other hand, indigenous women have experienced much violence in their homes by their husbands and their community. Likewise, the violence that has been exercised against the spirituality of these peoples is an epistemic violence that stigmatizes the indigenous knowledge that includes spiritual knowledge and their cosmovision." (Guardians of the Forest)

Often, the initial trigger or interactions by one or more actors (community and/or external contacts) drew additional interest and support from a broader base of community members. For example, in Columbia, community members identified that violence against their territory and women was an interconnected issue, which led to the research's purpose of eradicating violence against both the territory and local women. In addition to eradicating violence, other purposes of the Guardians of the Forest project were for community members to strengthen their knowledge of plants, herbs, and forest vegetation, which would support autonomy over and preservation of the territory, preserving both the knowledge and the territory for future generations.

Similarly, community members in the Arctic focused on learning about and caring for polar bears (nanuk) and their habitats, particularly in the face of climate change, and providing opportunities for intergenerational learning between Inuit elders, knowledge holders, and youth. Meanwhile, understanding community health and well-being impacted by COVID-19 and climate-related events (e.g., fires, floods, and landslides) was prioritized by Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation. Although sparked by a call to participate by a Health Director, the entire two-year research process by both First Nations was community-driven and participatory. Community members determined the questions to be asked, how they would be asked, where they would be asked, and how the data would be analyzed and disseminated.

"Interactions with academic knowledge in the Nanuk Narratives project involved a collaborative process where academic and governmental representatives worked alongside Inuit Knowledge holders to conceptualize the initiative, co-create content, interpret data, and guide the storytelling. Academic knowledge, particularly from wildlife biology, ecology, and social sciences, was integrated into the project primarily through the Interdisciplinary Working Group, which included members from various academic disciplines and institutions across Canada. While Inuit Knowledge provided place-based insights into polar bear behavior, abundance, and health, academic contributors offered research methodologies that enabled a broader understanding of polar bear conservation that bridged the gap between local understandings and scientific approaches." (Nanuk Narratives)

Early Interactions with External Experts

Often, through informal or casual interactions with external academically trained experts, community actors/leaders would develop ideas for undertaking systematic research on issues that concerned them and their communities. After these early interactions, research ideas and plans would be formulated. Community leads and external parties often negotiated informal agreements to establish how they would collaborate or work together; however, the formation of formal working agreements was usually facilitated by individuals external to the community. These individuals acted as intermediaries between community leads and

external parties interested in supporting the community's research initiatives.

Within the case studies, working agreements to support the community research emerged in one of three ways:

1. External nudging for agreement to undertake joint research (Malaysia & India).
2. Individual leaders already familiar with external experts driving the process (Colombia & Uganda).
3. Formal mechanisms for working together previously established (Artic Canada & Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation).

To help form a working agreement in Malaysia, a professor from UNIMAS acted as an external intermediary. In contrast, more external parties were directly involved in the initial stages of the case study from India. A regional representative from the Himalayan Action Research Centre (HARC) and several forestry experts participated in discussions with local women on topics ranging from researching local seeds to improving livelihoods through local resources and the systematic study of wild plants, berries, seeds and other vegetation to build on the traditional knowledge of the women. HARC's field coordinator actively catalyzed the process and led the conversations with local women focused on the marketing potential of traditional wild edibles and medicinal plants.

As noted previously, Miss Julie was the initiator of the project in Uganda and the key intermediary between the communities in Gulu and external parties. Miss Julie played the role of the community leader and, with support, mobilized community members to join community-based research activities. Within the Columbia-based case study, Waldina Munoz was a local community leader and intermediary. Like Miss Julie, Waldina also mobilized community members to join her in the research process. To develop the Guardians of the Forest program, Waldina gained confidence from conversations with external experts from an international NGO and found financial support from the Norwegian Human Rights Foundation. During the first workshop, Waldina gathered participants and led initial discussions between community members and professional forestry engineers.

More formal working relationships were already established in the Arctic region and Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation territories. Guidance was outlined for the Nanuk Narratives by Inuit community members connected to regional working groups and co-management boards. This guidance identified Inuit Knowledge holders across the Davis Strait region of the Arctic who could offer insights into polar bear management, ecology, and cultural practices. Before any community was entered, a list of knowledge holders was provided outlining which community members to work with and how the work would be conducted, which facilitated "*meaningful exchanges between outside filmmakers/researchers and local knowledge holders*." (Nanuk Narratives).

One community project was initiated through the Tl'etinqox Government's winter newsletter, in which a section was written by the Health Director, Nisga'a Dr Mitch Verde, to community members acknowledging the frustrating length of the COVID-19 pandemic and asking for them to help Tl'etinqox Health develop a ten-year health plan. Although the project was launched in February of 2022 by a Health Director, relationships between the two First Nations were well-established in this region long before the call to collaborate on this project and would last far beyond its end. When the research project ended, relationships among community members and external parties (e.g., university researchers) involved in the project continued.

> "In this project with the Tsilqot'in and Secwepemc peoples, there exists a long history of respectful relations between the communities and university partners. In some instances, for example between the Thompson River University (TRU) researcher and Tsilqot'in researchers, these relationships are family-based, not just research-based. There is an understanding that these relationships are long lasting and will continue into new research projects, family, and friendships. This is a continuation of relationships, not the end." (Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation Case Study)

Knowledge Systematization

This section begins with an acknowledgement that knowledge systematization is an academic term. However, DECODE case studies revealed that knowledge has been and will continue to be systematically shared in these communities. Case studies were often initiated by local knowledge keepers who identified the value of local knowledge (e.g., traditional, community, and/or Indigenous) to address various climate-related activities. Reasons for further enquiry and knowledge systematization in these community-driven research initiatives were practical and supported the community's needs identified by community members. For example, in Malaysia, India, Uganda, Columbia, and the Arctic, community members decided to systematize and share their knowledge to protect important species, help sustain community members' livelihoods and support cultural continuity.

Members of the Penuak community in Malaysia focused on systematizing knowledge to enhance the sustainability of Apong harvesting in the modern world. By engaging in participatory dialogues with UNIMAS researchers and other stakeholders, community members

co-developed structures such as the Samarahan Apong Cooperative, recorded traditional practices, and standardized harvesting and processing methods. These collective efforts allowed Penuak community members to transform tacit, individually held *know-how* (knowledge) into shared protocols that improved efficiency, product quality, and market access. In comparison, local Himalayan women wanting sustainable incomes entered the systematization of their knowledge by experimenting with alternatives to sacred plants (Tulsi) and collecting household practices related to the use of wild berries, seeds, and shrubs, which helped them to define the species culinary and medicinal qualities clearly.

In contrast, when Miss Julie, a community leader of the Wise Women of Uganda, spoke with external researchers about the systematization of knowledge, it was clearly stated that for the Acholi people, "*knowledge was always systematized, and it relied on the interconnection of being and knowing*." Although knowledge was systematized throughout history, there are layers to transmitting Acholi knowledge in that not everyone had access to all sacred knowledge. With this stated, Miss Julie also identified that expanding the sharing and systematization of traditional knowledge was crucial due to the extent of deforestation in the region that impacted local species and community members' abilities to participate in cultural practices and cultural continuity. Through Miss Julie's work with the Wise Women of Uganda, traditional and modernized methods of systematizing knowledge were evident. These methods ranged from restoration activities, which included creating gardens of indigenous trees and medicinal plants, to land-based training programs focused on tree management, care, and sustainable practices like agroforestry, to guided discussions and the documentation on the dangers of deforestation and the value and uses of native tree/plant species. A specific example of the modernization of knowledge systematization was that traditional knowledge from Uganda healers was being written down to be shared with future generations.

The ongoing need to protect women and the territory led to the creation of the Guardians of the Forest program; however, it was connecting with the DECODE project that supported more formal knowledge systematization processes to take root. The program wanted a repeatable process for understanding and sharing local knowledge. Through this deliberate knowledge systematization process, members from three different regional communities participated in the research activities and strengthened their working relationships. Participants appreciated making an illustrated booklet as part of the knowledge systematization process as they could see themselves represented in the illustrations even if they could not read or write. Systematizing their knowledge also helped the Guardians of the Forest replicate similar processes and experiences with local children. The Guardians of the Forest are now considering how to further systematize and distribute their knowledge.

Gathering community members was essential to knowledge systematization across all the case studies. For the Nanuk Narratives project, which spanned the Davis Strait region, film was chosen as the primary communication tool partly because of its capacity to visually and emotionally convey complex cultural and ecological knowledge in ways that written or spoken words alone could not. Using film as a medium allowed the program to gather and share knowledge systematically and allowed Inuit voices to be heard directly, ensuring their perspectives on polar bear management, ecology, and cultural significance were represented. The film series offered the project a dynamic and engaging platform for storytelling, which was central to Inuit culture and traditions. Through the films, Inuit community members shared their experiences and nuanced observations about polar bears, making their knowledge accessible to diverse audiences, including government agencies, researchers, and the public. Filming community members helped to bridge the gap between Inuit and Western knowledge systems and offered a holistic approach to polar bear conservation and stewardship. By organizing and sharing Inuit knowledge through film, community members ensured that their cultural identity, environmental stewardship, and long-standing relationships with polar bears were acknowledged and more easily understood by others (e.g., policymakers and scientists).

Within Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation's case study, "*hunters, language teachers, students and youth came together in the Tl'etinqox and Qwelmínte Secwépemc research and together they impacted their communities in multiple ways*." Knowledge in this region was systematically gathered through community-based activities and informed by Indigenous Research Methods (e.g., interviews, sharing circles, etc.). Drawing on these methods contributed to the researcher's abilities to understand identity, strengthen culture, and enhance the sharing of Indigenous voices and their concerns at government tables. The collective efforts to gather and share knowledge through this project supported efforts to establish healthier communities, strengthen language and culture, and address climate change-related issues. Critical to this knowledge systemization process was that both First Nations maintained Indigenous autonomy; each had choice and control over their research processes and how research findings were shared (e.g., with external groups and one other). Contextual understanding was essential to the First Nations' knowledge systematization and research processes.

"It is important to understand how the Indigenous knowledge was contextualized by the Indigenous researchers. For example, one Tl'etinqox researcher is a language teacher in the local school (within the Tsilqot'in territory) and experienced the interviews through that cultural lens. Another Tl'etinqox researcher is a traditional hunter and relied on that specific cultural perspective when listening to the interviewees. Another of the researchers traveled with her Chief to Ottawa to talk about the Tsilqot'in language and laws and is fully immersed in her own culture.

Within the Qwelmínte Secwépemc research focus, there was a reliance on Secwepemc stories, ancient stories, and the Standing on Two Legs model to search for ways to balance traditional knowledge and western science. The difference between Qwelmínte Secwépemc students and the Tl'etinqox traditional knowledge and language holders was evident in other ways. For example, some of the students were involved for two years on the project (May to September), while other student researchers were new each year. Bringing the year two students up to an equal level with the previous years' students was a challenge for the Qwelmínte Secwépemc group." (Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation Case Study).

Case Study-Specific Research Methods

Two overarching questions guide this section of the preliminary findings. These research questions were:

1) What were the research methods used in each case study? (For details on the specific research methods of each case study, refer to previous data collection sections).
2) Which research methods used, if any, were purpose-linked, enabling community agency?

Research methods linked to the community initiative's purpose and that enabled agency were activities that a) met current community needs, b) placed importance on connecting through the arts, land, and language, and c) were accessible and culturally relevant for all community members.

Meet Current Community Needs

The purposes of enquiry and knowledge systematization within the community-driven research projects were community members' current and practical needs. Activities to address practical needs and find solutions to improve community members' lives drove collaborative efforts. Research plans and methods often evolved in response to meeting the communities' action-oriented purposes for gathering and sharing knowledge. A common feature in all cases was that they used arts-based and land/place-based activities to support data collection.

The Importance of the Arts, Place-Based, and Language

Arts-based research methods emphasized that lived experiences and emotions were legitimate forms of knowledge. Blending the arts with social/emotional experiences (e.g., emotional timelines and social mapping) enriched community members' participation in research processes. Infographics and the use of visual tools aided in communicating key findings (e.g., to funders and policymakers). Mediums, such as illustrations and photography, were commonly used in collection, systematization, and dissemination.

Land or place-based research activities were found in all the case studies and included tours of the territories and community gatherings (e.g., around a fire, meals, or central location). It was also established that daily practices, such as those occurring within households and communities, were learning sites. Through these land- or place-based activities, informal conversations were held, and knowledge was shared intergenerationally. Local cultural ceremonies and festivals were also occasions for developing new knowledge and sharing between community members. Understanding local practices and traditional languages of community members, including specific dialects, were essential starting points for developing deeper understandings and meaning through the research process.

Accessible and Culturally Relevant Research Activities

Accessibility was another important consideration when deciding which research methods or activities were used in the initiatives. Some community members were less familiar with the written word and were less comfortable reading or writing than speaking or singing. Methods often evolved in response to such situations. For example, the social cartography (mapping) activity used in the case study from Columbia needed to address the fact that written forms of communication were inaccessible for some community members. In contrast, imagery and verbally sharing experiences collectively were more practical. More culturally aligned methods for community members included walks in the territory, fire-side chats, and storytelling. By connecting with community members and understanding their comfort with various forms of participation and communication, research methods became rooted in local and culturally relevant practices familiar to community members.

The case studies highlighted how vital the understanding of context is for community-based research to be relevant. In Malaysia, Penuaks' understanding of Apong harvesting techniques, sap collection, firewood management, and product processing is rooted in everyday practice and cultural memory. They viewed their expertise as "*know-how*" and as part of their identity, social fabric, and connection to the mangrove ecosystem. Similarly, local Himalayan women shared knowledge of household practices related to the use of wild berries, seeds and shrubs and defined their culinary and medicinal qualities. The Wise Women of Uganda's regenerative approach also recognized the interconnectedness of the environment, community well-being and traditional knowledge. Knowledge was embodied and passed down experientially and systematically from elders and ancestors. Interpreting and communicating across time and space is understood by many Acholi, but only a few are recognized as capable of doing so." Short workshops with women and then studying the herbal plants together through walks in the territory were key methods of systematization. This case study used storytelling, timescapes, and narratives as accessible and culturally relevant research methods.

With members of the Pastos, Yanaconas, and Embera Chamy communities of the Putumayo region in Columbia, a range of research methods were used that were culturally accessible and relevant. Walking through the territory and building a list of names and uses of different plants/trees and their parts were central methods of gathering and systematizing knowledge. Walks began with harmonizations by Elders to announce community members' entrance into the forest, and through the walk, rituals were performed at various sites. Additional culturally relevant and accessible knowledge-sharing activities within the Columbia case study included:

a) Introductions, choosing an animal they identified with and shared a smell that reminded them of their territory,
b) Individual heartbeat timelines to mark the highs and lows of their emotions during the process of the Guardians of the Forest,
c) A group heartbeat timeline to reconstruct the history of the Guardians of the Forest and
d) Social cartography: Everyone contributed to the route map, revealing their knowledge of the territory and how this constituted them as guides and Guardians of the Forest.

In contrast, in the Arctic, it was decided that filmmaking would gather information from various local communities and knowledge keepers. Community members viewed video as an accessible and culturally relevant helpful tool for collecting oral histories, stories, and examples in regional languages. For Tŝilhqot'in First Nation, local Indigenous youth were trained in Indigenous research methodology as knowledge of the local language was critical to answering the research questions. Within Qwelmínte Secwépemc First Nation's research focus, there was a reliance on Secwepemc stories, ancient stories, and the Standing on Two Legs model to search for ways to balance traditional knowledge and Western science. For this research project, it was essential to understand how each Indigenous researcher contextualized Indigenous knowledge. For example, one Tl'etinqox researcher is a language teacher in the local school (within the Tŝilhqot'in territory) and experienced the interviews through that cultural lens. Another Tl'etinqox researcher was a traditional hunter and relied on that specific cultural perspective when listening to the interviewees. Elders, hunters, language teachers, students and youth came together in the Tl'etinqox and Qwelmínte Secwépemc research, and together, they impacted their communities in multiple ways. Providing diverse options for data collection and knowledge-sharing activities helped to ensure that all the community-based activities were relevant, inclusive, and respectful.

Section Two: Community Knowledge and Cultures

Preliminary findings related to community knowledge and cultures from the six case studies are shared within this section.

Deepening Our Understandings of Community Knowledge: Meanings and Knowledge Culture

What is community knowledge, and what are the values attached?

This section explores the concept of community knowledge and how knowledge is created, curated, validated, shared, and/or acted upon in various settings (Lepore, Hall, and Tandon, 2024). What emerged related to community knowledge cultures was that interconnections between the land (or territory), culture and community, and values guided the communities. Some values were similar across the case studies; others were specific to their experiences and/or cultures. This is not an exhaustive understanding of these communities' values and meanings. Further dialogue, reflection, and/or research is required to verify these interpretations.

Interconnections of Land, Culture, and Community

Community knowledge and/or Indigenous knowledge is typically place or land-based. Land sovereignty was connected to preserving knowledge systems and the capacity to participate in climate adaptation, and Indigenous stewardship of land contributed significantly to biodiversity preservation and ecological sustainability. There were direct links between knowledge of culturally important plants (e.g., medicinal and/or spiritual) and species conservation, and the avoidance of overexploitation of biodiversity, forests, wild gardens and more. Historically, as territory and land became more fragmented (e.g., related to urbanization, feudalism, and capitalism), it

resulted in the increased fragmentation of land-based knowledge and community knowledge cultures. All the case studies highlighted that there was no separation of community and/or Indigenous knowledge from land, identity, language, and culture (e.g., dreams, spirituality, ancestral spirits) and all living earth, plants, and animals. Respect for interconnectedness was central to all the community and/or Indigenous knowledge cultures.

"The value of respect is most clearly defined as a mutual respect between all living beings, whether these are people, animals, birds, the land, air and water. In Indigenous ways of being, we recognize that People are the least important. For example, the land, air, waters and animals/fish do not need people to exist, however people need the land, air, waters and animals/fish to exist. At all times, our Original Laws remind us that our position in importance to health and well-being is completely reliant on Mother Earth. It is not the other way around, as Western thinking would have us believe where People (and specifically White Men) are at the pinnacle of importance." (Guardians of the Forest Case Study)

Preliminary findings suggested that community and/or Indigenous knowledge cultures were not the enemy of other forms of knowledge (e.g., Western science). Various knowledge cultures could be respectful partners within community-led and participatory research initiatives. In each case study, the bridging of knowledge cultures occurred, through the sharing of traditional/Indigenous knowledge with external knowledge cultures (e.g., academic or Western science). In many case studies, bridging knowledge cultures was critical to developing strategies to address the climate crisis. Showing respect for interconnections and the value of multiple sources of knowledge (e.g., knowledge cultures) assisted the community-based projects to find new pathways to address issues of concern and build resiliency.

Community Values

Community values that emerged within the case studies included respect, relationality, sustainability, interconnectedness, community well-being, cultural continuity, intergenerational experiences, inclusion, collective benefits and openness to learning. Table 8 provides examples of community values identified in each case study. This is not an inexhaustive list of all the community and/or Indigenous values found within these regions or communities.

Table 8: Community Values

Region	Examples of Community Values Identified
Malaysia	Sustainability, cultural continuity, equity, mutual support and respect for nature, collective benefits, fairness, inclusivity, ecological balance, mangrove ecosystems, adaptability, and bridging traditional practices and modern processes.
India	Cultural continuity, traditional practices, sustainability, adaptability, culinary traditions, family, teamwork, collective decision-making, reliability, growth and development, respect for, and inclusion of all community members.
Uganda	Traditional knowledge, embodiment, spirituality, ancestral wisdom, spiritual guidance, intergenerational relationships, medicinal plants, traditional healing practices, environmental preservation, co-existence, practical skills, experiential learning, regeneration, interconnections, and community well-being.
Columbia	Relationships, cosmovision, spirits, soul, communication, family, gatherings, harmonizations, offerings, intergenerational learning, and care for territory and self are one and the same.
The Arctic	Inuit knowledge, respect, interconnection, holistic worldview, Elders, intergenerational knowledge transfer, storytelling, oral histories, stewardship, experiential and land-based learning, co-governance and co-management.
Tŝilhqot'in First Nation and/or Qwelmínte Secwépemc First Nation	Indigenous knowledge, oral traditions, the natural world, language, culture, emotions, spirituality, physical, traditional practices and skills, respect, reciprocity, responsibility, relevancy, intergenerational knowledge transmission, listening, knowledge holders, balance, Standing on Two Legs Model (Qwelmínte Secwépemc First Nation), community, self-determination, Aboriginal Rights and Title, community health and well-being, and collective decision-making.

In Malaysia, Penuak's traditional practices provided a sustainability model deeply rooted in cultural wisdom. Traditional practices ensured the continued productivity of Apong trees and preserved the delicate balance of mangrove ecosystems. Modern technologies made work more manageable, but traditional approaches kept the community and environment in balance, serving as a reminder that sustainability was not a modern concept, but a way of life intricately woven into the heritage of Penuak communities.

"Being a Penuak is more than just a job; it's a way of life." (Apong Modernization Project)

Penuak cared for the trees and the land, ensuring productivity for generations. Their knowledge was based on long-standing traditions passed down through generations. Throughout the project, Penuak prioritized maintaining the ecological balance of mangroves, preserving their cultural heritage, and ensuring that knowledge transmission was fair and inclusive and benefitted all members. They also valued adaptability—embracing modern tools while preserving fundamental traditions—and collective well-being, which was evident in the creation of their cooperative.

Collective well-being also emerged in the case study from India, as Himalayan women have long been the providers of meals for their families, and the wild edible plants available in their surroundings were crucial resources during drought and food shortages. Serving as a reliable support system during tough times, wild edibles were naturally resistant and adaptive to microclimatic changes such as low rainfall and high temperatures. While agriculture struggled to cope with these climatic shifts in the region, wild edibles offered viable options for the local communities to sustain their livelihoods. By practising age-old methods of using wild produce, local women inadvertently adapted to climate change and carved new paths for themselves. The Women's Cooperative was based on a model that encouraged teamwork, collective decision-making, and a shared vision of growth and development while ensuring that every member (and their knowledge) was valued and included.

For the Wise Women of Uganda, Acholi knowledge is a rich and dynamic system encompassing practical skills, spiritual beliefs, and a deep understanding of the natural world. In Gulu, knowledge and spirituality were intertwined with principles of environmental preservation and co-existence. For the Acholi people, knowledge was embodied and passed down experientially and systematically from elders and from ancestors across time and space. Interpreting and communicating across and through time and space was understood by community members, but only a few people were recognized as having the capability. Miss Julie, a botanist and traditional healer, stated that traditional knowledge was passed down through generations and could not be gained from books or formal education. She recounted firsthand experiences where her grandfather introduced her to medicinal plants without explicitly explaining their uses. Knowledge of the plants' uses came later through spiritual guidance after her grandfather's death, signifying a belief in transmission through ancestral wisdom. Community members identified that traditional Acholi knowledge and culture were continually impacted by colonialism, Christianity, war, and modern development, reducing traditional knowledge transmission. Therefore, the Wise Women of Uganda's regenerative approach focused on the interconnectedness of the environment, community well-being, and the ongoing transmission of their traditional knowledge.

For Guardians of the Forest community members, the relationship with the territory transcended the material or political plane. Based on their cosmovision, the territory, the plants and animals had life, soul and spirit. Their traditions reiterated that relationships between humans, spirits of the plants, forest, and Pachamama (Mother Earth) must be cared for, strengthened, and engaged with through constant communication. Maintaining constant communication between the earth, spirits, and community members was vital to the local culture; communication was supported through harmonizations, rituals, offerings, and the use of traditional foods, medical plants and practices.

Similarly, Inuit knowledge systems included core values of respect, interconnectedness, holistic understanding, Elders, land-based experiences, and intergenerational knowledge transfer. The Nanuk Narratives focused on respecting diverse voices and drawing on that knowledge to care for the land, animals, and community members that coexisted in the Davis Strait region. It was vital that how Inuit stories were collected and shared reflected lived experiences, interconnections, and respect. Elders helped to guide the direction of the project, and it was vital that youth were actively engaged throughout the whole research process to ensure the continuation of care for the nanuk and culture.

The central teachings of Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation also included respect, reciprocity, responsibility, and relevance. For members of Tŝilhqot'in First Nation and/or Qwelmínte Secwépemc First Nation, knowledge was passed down through oral histories, traditions, experiences in the natural world, and embedded in traditional languages, cultural, emotional, spiritual, and physical and practices (e.g. hunting, fishing, weather and animal observation, and skills). Specifically for Qwelmínte Secwépemc researchers, there was a reliance on Secwepemc stories, ancient stories, and the Standing on Two Legs model to search for ways to balance traditional knowledge and Western science. Elders, hunters, language teachers, students and youth came together in the Tl'etinqox and Qwelmínte Secwepemc research, and together, they impacted their communities in multiple ways.

"We are taught that there are seven different kinds of listening... Listening begins with opportunities to hear about what others are doing in culturally enriching ways and to speak about how it feeds you, mind, spirit, body and emotions." (Tsilqot'in First Nation and Qwelmínte Secwépemc First Nation)

All case studies highlighted the importance of listening to traditional knowledge holders and what they had to share, particularly around the care required for ecosystems to remain supportive of human health.

Establishing Relationships of Trust: Partnerships Over Time

How do community research processes help build relationships with partners over time?

Trust-building between communities and external experts was fundamental to the success of the community initiatives. To maintain trust, long-term relationships were required between members of different knowledge cultures. Knowledge intermediaries or boundary spanners (e.g., individuals who navigate the boundaries between groups and/or knowledge cultures) played key roles in building relationships, establishing trust, and bridging gaps in understanding. Through collective research processes, safe spaces were created for authentic conversations among community members and partners. Community members gained greater collective strength as research results unfolded and noticeable changes occurred.

In Malaysia, the Apong cooperative highlighted how relationships within the community and with external parties were key to ongoing sustainability and blending traditional practices with modern technology. Initially, members of the Penuak community began to learn about using hybrid stove technology to produce Apong nectar. Over time, Penuak gradually formed a cooperative of Apong nectar producers, and the cooperative directly contributed to research purposes. Their inclusive, dialogue-based approach ensured that all voices were heard and helped establish clear agreements recognizing each participant's contribution. The Apong Modernization Project also brought together an expanded network of stakeholders, including the District Officer, Suruhanjaya Koperasi Malaysia, Department of Agriculture (DOA), Jabatan Agama Islam Sarawak (JAIS), and Kementerian Kesihatan Malaysia (KKM). External partners (e.g., government agencies, funders, NGOs, and industry stakeholders) connected with the community through local authorities, cooperatives, and personal networks. These external stakeholders played crucial roles in the project, from facilitating cooperative management to ensuring compliance with health and halal standards. Relationships between multi-stakeholders and knowledge cultures enriched The Apong Modernization Project's scope and strengthened its sustainability. External parties attended community meetings, village events, and workshops, where they engaged directly with Penuak leaders and elders. Their on-the-ground presence allowed external parties to learn about traditional practices firsthand. Trust and reciprocal learning were fostered when external partners approached the community and humbly listened to their needs and aspirations.

In contrast, the Women's Cooperative emerged from a collective will to grow, harvest, and create food products based on local seeds, wild berries, and herbs. Relationships between the women and external partners formed around these shared goals. In addition, during shared efforts to systematize knowledge, relationships between all parties deepened, and cooperative processes were strengthened. Since its initial efforts to gather local knowledge, the cooperative and its structures have evolved and expanded. New members have joined, and commercial aspects of the cooperative have flourished. The Women's Cooperative impacted the women and their families but also enhanced the lives of community members within the region, and plans were emerging to expand into new regions to support additional communities and generations of women to sustain their livelihoods.

Relationships between knowledge cultures within the Uganda case study were also extensive. The Wise Women of Gulu gradually became the Wise Women of Uganda. The organization diversified its membership and gained visibility in Kampala and beyond. The program welcomed and trained international students, doctors, and researchers interested in learning about traditional medicine practices and environmental conservation. These individuals were often connected to the program through partnerships with organizations (e.g., ActionAid) or through personal connections and inquiries. Miss Julie's connections with Gulu University and the Gulu School of Health Sciences also helped to train pharmacy students in the propagation and uses of medicinal plants. Collaboration with various organizations was crucial for disseminating Acholi knowledge and promoting sustainable practices. The program found creative ways to partner with companies and organizations to support continuing their knowledge and cultural practices. Examples of these creative collaborations include:

a) **National Forest Authority**: Expanded forest areas and managed land for conservation.
b) **Sasakawa**: Introduced new crop varieties, like wheat, and promoted agricultural diversification.
c) **Oil Companies:** Focused on environmental mitigation and education programs.
d) **United Nations Population Fund**: Addressed issues like gender-based violence, which had implications for environmental sustainability as women often bore the burdens of collecting water and firewood.

In-person relationship-building activities were central to the Guardians of the Forest. The program began as a friendly coalition to prevent future violence against the land and local women. In Putumayo, the program deliberately brought together three different communities from across the region in the research process to strengthen connections and collaborations. An established basis of trust and reciprocity developed throughout the two years of the project, which made the systematization of knowledge with program participants feasible. Based on their understanding of trust, it was expected that no one would take advantage of the shared knowledge

and that it would be enhanced and preserved instead. Reciprocity agreements were also made so that everyone knew how each community benefited from participating in the case study with the DECODE Project. These benefits were collectively agreed upon before any formal processes of knowledge systematization began.

Multiple communities, organizations, co-management boards, and governments within the Davis Strait region of the Arctic came together to be part of the Nanuk Narratives. The Arctic case study was an example of extensive co-management, where diverse knowledge cultures and systems worked together. Within this example, local Inuit leaders, scientists, and administrators worked together and developed an appreciation of the synergy between their diverse knowledge cultures. At times, it was challenging for all parties to agree, but the shared commitment to co-management and co-governance to care for nanuk helped to maintain the diverse relationships over time.

The community members of Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation held long-standing intertwining histories and extensive knowledge of working and living alongside one another. Through this research project, the synergy between community knowledge perspectives and university-based researchers (many of whom come from indigenous communities) increased. Since the study and as a continuation of their commitments to work and research together, Tŝilhqot'in First Nation and Qwelmínte Secwépemc First Nation community members have formed an alliance for future research-based collaborations.

Investing in Community Capacity

Community capacity is contextual; however, capacity development for community members was crucial within the community-based research initiatives. Structural support through cooperatives, local organizations, and governance mechanisms enhanced effectiveness. External partners supported community initiatives through policies and funding opportunities focused on training and building skills, infrastructure, and leadership. Capacity-building initiatives/examples from each case study have been summarized in Table 9.

Table 9: Examples of Capacity Building Initiatives

Region	Examples of Capacity-Building Initiatives
Malaysia	The Apong Modernization Project equipped members with modern production skills, business knowledge, and entrepreneurial confidence. In-field testing of modern techniques and equipment diversified how Penuak processed Apong. Participation in the Apong Collective enhanced collective decision-making processes, stewardship practices, and processing capacity.
India	HAKVBSS offered comprehensive training programs to empower women with essential skills for every production stage and aimed to boost confidence. Training programs covered all aspects of work, from harvesting to processing, packaging, and marketing. The Women's Collective taught inventory and material handling, pre- and post-harvest methodologies, and the practical application of new technologies. Sessions build skills, confidence, and self-reliance. A diverse group of experts, including external specialists from state universities, food scientists, experts from HARC, and experienced women from within the cooperative, assisted in providing the training.
Uganda	Through training and outreach programmes, the Wise Women of Uganda program engaged community members in tree planting and other conservation activities and promoted collective responsibility for environmental stewardship. Program-specific training focused on several topics: a) Traditional medicinal practices, b) Tree management and care, c) Environmental conservation and regeneration, d) Sustainable livelihood skills, and e) Literacy and empowerment. Their advocacy and outreach campaigns educated the public about environmental conservation, hygiene, and sustainable practices.
Columbia	Through in-person and land-based knowledge-sharing opportunities, community members enhanced their collective knowledge of the region and its plant species. The Guardians of the Forest Project also planned to replicate land-based activities and knowledge-sharing opportunities with children (guaguas) of the communities to train them to become Little Guardians of the Forest.
Arctic	Community leaders had a broad interest in supporting capacity building. Through the Nanuk Narratives, local filmmakers and youth were provided opportunities to develop film production and storytelling skills. The resources developed throughout the project also aimed to support future generations in Inuit-led stewardship and wildlife management.
Tsilqot'in First Nation and Qwelmínte Secwépemc First Nation	Capacity building occurred throughout the research project and varied between the communities. An example of collaborative efforts to enhance research capacity-building skills occurred through the development of the Indigenous Research Methods (IRM) course. Collaborative workshops ensured that the Tl'etinqox and Qwelminte Secwépemc community members played leadership roles in designing and conducting the research, evaluating its outcomes, and disseminating findings in culturally appropriate ways.

Supporting Co-Management and Governance with Community Leadership

A continuum of leadership/governance structures was present within the case studies. The spectrum of community members and involvement in the projects included:

- Community members supported knowledge sharing, systematization, transmission, and dissemination/mobilization.
- Community organizations set agendas for addressing community challenges and secured support from other local people (e.g., government, NGOs, individual professionals) that they already knew.
- Community members asked local professionals for help to establish further connections with external 'experts' (e.g., from NGOs, academia, business, etc.).
- Community members and regional teams from DECODE co-designed knowledge sharing, data collection, and/or resource mobilization activities.
- Community organizations directly contacted academic 'experts' to work on the community agenda and sought funds for their involvement.

When communities led the research agenda, it ensured that the research's purpose and processes aligned with local needs and priorities. Partnerships also flourished when communities retained control and co-governance over the research processes, and the research was more effective and relevant when co-designed with community members.

Within the Apong Modernization Project, Penuak emphasized that knowledge was collectively produced and maintained. Community members, supported by researchers and cooperative leaders, clarified that knowledge (e.g., traditional harvesting methods, product innovations, and collaborative management strategies) remained the community's intellectual property. The Cooperative established agreements that ensured that no single entity could monopolize or exploit communal expertise without consent, and benefit-sharing negotiations occurred through open, transparent community meetings facilitated by cooperative representatives and researchers.

For The Women's Cooperative, participation and decision-making involved two layers of membership. At the heart of the cooperative were its 210 primary members. These women were directly involved in the day-to-day operations and worked in various roles. A wider circle of 4,000 secondary members, including farmers supplying raw materials, local artisans, and other community members, contributed to the cooperative's ecosystem. The Women's Cooperative fostered a sense of collective ownership and community participation by including primary and secondary members. Investment decisions occurred during quarterly meetings involving the core women members and representatives from HARC. This collaborative decision-making process ensured that investments aligned with the Cooperative's goals and the community's needs, fostering a sense of ownership and empowerment among the women.

According to Miss Julie from the Wise Women of Gulu, ownership of knowledge permanently resided with the community, particularly regarding healing practices. Although knowledge was shared with members from diverse knowledge cultures, Miss Julie expressed concern about external entities, particularly universities, fearing the appropriation and commercialization of traditional knowledge without fair recognition or compensation.

In Columbia, the co-management of resources involved three different communities. Community members knew the plants in their territories; however, each community had other names for the plants based on their native languages, and their uses (e.g., medicinal, cosmetic, ornamental or food) varied. Through knowledge sharing, community members learned new names and uses of the plants. By connecting with forestry professionals, the program assisted community members in integrating Western science into their knowledge base. Community dialogue enabled the gathering, sharing and generation of knowledge, strengthening community members' resolve to defend the territory. Throughout the project, local knowledge highlighted the importance of nature and spirituality. The Guardians of the Forest committed themselves to recovering their knowledge and preventing its disappearance, protecting both the land and its people.

The Nanuk Narratives project emphasized transparency and collaboration in the ownership and management of its content. Central to this project was a data-sharing agreement that ensured all partners and collaborators respected the values, needs, and priorities of the Inuit communities involved. Through this understanding, all data collected, including video, text, and qualitative data, remained the property of the communities and co-management boards. Community partners also determined how best to manage public data-sharing and the translation of materials into additional languages. Although a written agreement was reached amongst all parties, it was challenging to get all partners to sign it as there were verbal understandings that each partner would be able to work with the content based on their region's needs. Nanuk Narratives provided an example of extensive co-governance processes that involved

diverse knowledge systems. Scientists and administrators collaborated with local Inuit leaders, fostering appreciation between diverse groups and their knowledge systems. In the context of Nunatsiavut, co-management of natural resources has been the shared power and responsibility of the Nunatsiavut Government, the Province of Newfoundland and Labrador, and the Canadian Government.

A long history of working and living together increased synergy between the perspectives of Tsilhqot'in First Nation and Qwelmínte Secwepemc First Nation and their academic partners. For example, relationships between a Thompson River University (TRU) researcher and the Tŝilhqot'in researchers were family-based and research-based. Care and concern between community members and university-based representatives were evident in all their collective gatherings, as a shared understanding existed that relationships were long-lasting and would continue through research projects, family, and friendships. This research project was a continuation of previous relationships, and when it ended, the network of relationships remained.

Identifying Gender Issues: Women at the Centre

Numerous findings related to gender issues emerged in the case studies. In most cases, women were knowledge keepers. They were botanists, herbalists, hydrologists, veterinarians, architects, designers, etc.; however, many female community members often hesitated to express their knowledge. In contrast, not all the case studies explicitly identified women's roles or knowledge as distinct from other genders or groups within the community.

The Apong modernization project acknowledged that the initiative not only sustained traditional practices but also empowered the community through inclusive economic opportunities. For example, new opportunities were provided for women and younger generations to participate actively in the Apong industry. Since the project began, women have become more involved in managing the Cooperative, handling sales, conducting knowledge-sharing activities with visitors, and/or diversifying Apong-based products (e.g., fresh sap, Apong sugar, and nectar).

Women also played key leadership roles (e.g., as healers and herbalists) in their communities. Developing women's roles and sharing knowledge was essential in the case studies to enhance mentorship, validation, and empowerment. Collaborative and respectful environments enhanced women's participation and leadership in community-based activities. Qualities of listening, discussing, and searching for agreements were associated with women's ways of organizing. There were also linkages between the climate crisis and the need to understand traditional knowledge to provide quality care for the territory, culture, and community. Women in the case studies shared that care and community well-being were interconnected. For example, one of the Nanuk Narratives films, *How Did This Woman Survive a Polar Bear Attack?"* highlighted the importance of listening to, learning lessons from, and involving elderly women in Inuit life. The film *What Polar Bears Mean for Inuit* explained how similar female polar bears and Inuit women were when they entered periods of isolation during pregnancy and the early days with new offspring.

The Guardians of the Forest project arose to eradicate violence against women and violence against the territory, as both are the same. In their first community workshops, local women talked about the need for care of the territory and self. Within the Columbian case study, the most evident gender dynamics were:

> *"undoubtedly the power relationship between men and women. On the one hand, among the men of the communities, who seem to be the only bearers of knowledge, invalidating that of women and minimizing the role they play in their community. But also, among the experts since most of the experts were men in order to generate confidence in the men of the community so that they would agree to women attending each of the meetings. Atención e impactos sobre la resiliencia climática en su estudio de caso." (Guardians of the Forest Case Study)*

In Putumayo, Gulu, and the Himalayas, women gained confidence in their knowledge, particularly as the program gained visibility and respect. Through the Guardians of the Forest project, women from three different communities in Columbia were empowered to conserve their territory, as their voices, stories, knowledge, and personal experiences were recognized and validated.

Stemming from their involvement with The Women's Collective, local Himalayan women, who once shied away from even the simplest forms of self-expression, started to radiate with newfound confidence in their knowledge and skills. During the in-person workshop with the external researcher, local women recounted their transformations, attributing much of their growth to participation in the cooperative. Involvement in the Cooperative was not solely about learning new skills. It also supported profound shifts in their perception of themselves and their capabilities. The women acknowledged that the transformations occurred through formal training and the empowerment of being together.

In Uganda, Miss Julie pointed out that gender-based violence was a serious issue that was exacerbated by land disputes and economic disparities. Women's lack of control over resources made them targets of exploitation and abuse. Addressing this violence required challenging deep-rooted cultural norms and empowering women through economic opportunities and leadership development. In Gulu, training workshops with women began so they could create their herbal gardens. From these initial training opportunities and research emerged the "Wise Women" organization. The Wise Women of Uganda initiative focused on the empowerment of women in several ways, including:

a) **Economic Independence:** Through beekeeping and permaculture gardening training, women gained valuable skills to generate income and improve their livelihoods.
b) **Increased Confidence and Self-esteem:** The group's training programs, and advocacy work empowered women and boosted their confidence and self-worth.
c) **Support for Vulnerable Women:** The group specifically targeted vulnerable women, including those who are single parents, lack land or have experienced trauma, to train them and make them active participants in the community.

Through participation in the organization, new livelihood opportunities have emerged for local women based on environment regeneration and new trees and plants growing on their lands.

Connecting with Future Generations

How does this work impact future generations of these communities and foster better relations with them?

Each case study expressed how community members wanted to improve conditions for future generations, for their children and grandchildren—goals that prompted them to act and join these community-led projects. They focused on improving future generations' environmental, material, and social conditions.

In Malaysia, advancements in tools, harvesting, and processing techniques allowed Penuak to complete tasks by midday. This additional time enabled them to spend more time with family and explore other income activities (e.g., agriculture). The Apong Cooperative served as a voice for the community, advocating for their needs with government agencies and policymakers. It paved the way for socioeconomic mobility by reducing poverty and engaging younger generations. By respecting Penuak's traditional knowledge and combining it with modern techniques, the project preserved cultural legacies and created pathways for economic and social transformation, ensuring the Apong industry continued to thrive for future generations.

Through the case study on the Women's Cooperative in India, local women spoke of their pride in contributing to their families and communities and their determination to ensure their children receive quality education. The women emphasized sending their daughters to school and having them obtain a higher education. The drive to support their daughters' education was linked to the economic empowerment the women experienced by participating in The Women's Cooperative. The women were firm that their daughters would have the same opportunities as their sons and break cycles of gender inequality. Women in this region improved their lives and paved the way for future generations of daughters and daughters-in-law by acting as role models who exemplified courage, resilience, and the power of collective action.

In Uganda, community members shared the importance of environmental stewardship for their well-being and future generations. Through the Wise Women of Uganda activities, Acholi communities preserved and transmitted knowledge. As a community leader and knowledge holder, Miss Julie identified concerns about losing traditional knowledge connected to Indigenous trees and their uses, especially among younger generations. This motivated her to conduct community training sessions and support the documentation efforts. She acknowledged the importance of preserving traditional knowledge for future generations, as many younger community members were losing touch with their traditions.

For the Guardians of the Forest program, intergenerational learning was the goal of the third phase. In this phase, community members trained children to become future Guardians by actively transmitting local knowledge. The exercises related to systematizing their knowledge also provided materials to assist with transmitting local knowledge to children. Participants shared that the program had an immense impact on the permanence of their knowledge and the permanence of the forest.

The Nanuk Narratives video series shared the voices of seasoned hunters, respected Elders, cooks, and youth with younger generations. The films captured diverse, multi-generational experiences and knowledge related to their human-polar bear relationships. Videos were shared with youth in a variety of ways. In Nunavut Sivuniksavut, more than forty youths reflected on how the videos could support cultural continuity within their communities. Community leaders focused on building intergenerational capacity by offering local

filmmakers and youth opportunities to develop film production and storytelling skills. The project focused on sharing Inuit-led stewardship and wildlife management approaches with future generations. Community members felt responsible for maintaining balance within the ecosystem and ensuring that polar bear populations remained healthy and sustainable for future generations.

Through their collective research initiatives, Tŝilhqot'in First Nation and Qwelmínte Secwepemc First Nation members focused on empowering and recognizing youth leadership. Youth participated in a two-day symposium that linked Indigenous Elders to youth and presented findings at international gatherings. Engaging youth in language revitalization and cultural continuity were also aspects of the initiative. The research project identified that Western science had some solutions but emphasized that sharing Indigenous knowledge would help protect future generations further.

Acknowledging Cultures are Dynamic and Changing

How have traditional knowledge and scientific knowledge come together to keep cultures dynamic?

In every case study, different knowledge cultures worked together and recognized that multiple forms of knowledge, such as local knowledge or scientific research, contributed to shared goals. This openness and connection made community knowledge and cultures dynamic; communities retained parts of their traditions that made sense but actively challenged or changed those that no longer worked within modern contexts.

Learning from other knowledge sources to modernize production allowed Penuak to engage in other productive activities while preserving connections to traditions. Traditional harvesting methods subjected community members to various health and environmental issues, including muddy conditions and crocodile attacks, labour-intensive processes, smoke inhalation, and lower income due to inconsistent product quality and lack of access to clean water supply. These challenges contributed to the migration of younger workers to cities and the endangerment of the Penuak harvesting legacy. The hybrid stove offered an alternative to community members that reduced the time, effort, and health risks involved in traditional Apong harvesting and processing. The project created economic and social transformation pathways and ensured that the mangrove ecosystems and Apong industry would thrive for future generations.

In India, women empowered by their knowledge, skills, and enhanced livelihoods were firm that all their children (sons and daughters) would have the same opportunities, thus breaking the cycles of gender inequality. Changes also occurred within Uganda related to gender inequities that limited local women's abilities to participate fully in conservation efforts and benefit from sustainable livelihoods. Within the region, gender-based violence was a serious issue and lacked control over resources. Addressing this violence and lack of control over resources required challenging deep-rooted cultural norms and empowering women through economic opportunities and leadership development. Through the Wise Women of Uganda initiatives, Miss Julie supported the continuation of some traditional practices (e.g., land stewardship) but challenged the continuation of others (e.g., child sacrifice, and violence against women).

Women from all three of the communities in Columbia also experienced violence in their homes, and many of them were relegated to household chores; some were also illiterate. The Guardians of the Forest project helped local women feel more confident in their knowledge, which the men in the region have historically invalidated. The project empowered women to value their knowledge about plants, nature and their uses and gradually sensitized men to recognize and validate the women's knowledge. Through participation and recognition, the program promoted women's autonomy and fought against violence against women.

Key Messages

An initial review of the preliminary findings conveys several key messages for review and discussion. Comparative analysis of six DECODE case studies indicated several key messages about community-led research for climate resilience:

1. Community/indigenous knowledge is not the **enemy** of academic knowledge. These case studies show how interactions between community knowledge keepers and academic researchers were able to work together to achieve research purposes.
2. Community/Indigenous knowledge is more than ***know-how***; it is part of community culture and identity; it is embedded in a spiritual worldview with values of sustainability, conservation and inclusion, expressed in local languages & dialects.
3. Practical needs of the community define trigger new knowledge production and mobilization. When academic researchers integrate the same in defining shared research ***purposes***, interest in partnerships develops.

4. Recognition of distinctive community/indigenous ***knowledge cultures*** encourages the building and nurturing of partnerships of mutual respect and trust over time. Bridging knowledge cultures is facilitated through intermediaries of diverse forms, specific to each context.
5. Methods of Community-based Participatory Research ***(CBPR***), especially arts-based and culturally appropriate, support the inclusion of community knowledge in the entire research process through the creation of safe spaces for authentic collaboration.
6. Multiple ***forms of knowledge dissemination*** are deployed to reach a diversity of stakeholders. Both academic and popular forms of knowledge sharing are necessary for realizing the purposes of research established in the beginning.
7. Women's leadership and knowledge are central to such community-led initiatives. Gender relations in the community are transformed through public articulation of ***women's holistic knowledge*** about nature (land, forest, water, plants, animals, etc.).
8. Open discussion and agreements about knowledge sharing, knowledge ownership, and benefit sharing are key to building and sustaining trusting partnerships. Conversations about these ***ethical issues*** need to be held from the beginning and continue throughout the partnership.
9. ***Co-management*** and co-governance mechanisms between community and academic partners support impactful knowledge mobilization and sustained impacts. Community-driven co-management protocols help, even when formal arrangements of co-governance are not institutionalized.
10. As the six cases show, such research produces ***impacts on climate resilience*** and local livelihoods. Investments in building capacity during and beyond the research process further strengthen and empower community organizations.

Conclusion

The DECODE project questions how to better understand diverse knowledge cultures, participate in open knowledge sharing, and learn from communities and Indigenous-led initiatives regarding how they address community climate issues and develop climate resiliency. Drawing on community-based participatory research methodology and a knowledge democracy framework, the DECODE project compiled case studies of community-based participatory research initiatives and shared, analyzed, and disseminated preliminary findings. Preliminary findings have helped to deepen collective understandings of community and/or Indigenous knowledge sharing and use while addressing local climate change realities to enhance resilience. The next steps for the DECODE project include sharing, reviewing, discussing, analyzing, and verifying these preliminary findings and key messages with each of the community-based initiatives. Preliminary findings and key messages will be shared with DECODE's collaborators and global network via peer learning opportunities (e.g., webinars) and documentation. To continue supporting its three overarching objectives, DECODE will continue collaborating with additional community initiatives to develop more case studies. As the project progresses and new case studies are added, data will continue to be compiled, analyzed, and shared to expand knowledge democracy efforts and further understanding of community and/or Indigenous knowledge cultures.

Appendices:

Appendix A: DECODE's Guidance for Administrators When Initiating Collaborations with Regional Teams

DECODE guidance to its administrative team included:

1. Arrange an in-person kick-off meeting involving the regional researcher, community members, and other relevant participants (2 days).
2. Use this time to get to know the community and allow them to learn about you.
3. Spend this time familiarizing yourself with the community and their dynamics.
4. Encourage open dialogue to learn about their perspectives.
5. Once a level of comfort and rapport has been established through face-to-face interaction, begin discussions about the project.
6. Solicit feedback on DECODE from the community and understand their thoughts and ideas.
7. Be prepared to answer any questions or address any concerns the community may have regarding the project.
8. Observe and identify individuals who show potential to be community researchers, particularly those who have the capacity and enthusiasm to engage with study participants.
9. Once the rapport and trust are built, DECODE proceeded to Step Two with engaged community members who wished to continue collaborating with DECODE, and develop/share case studies of their Community Based research activities using the Story Map tool.

Appendix B: Case Study Guiding Questions to Support Development by Regional Teams

A. Context

1. Geography:
   - Where is the case study geographically located?
   - Are there any specific key geographical and environmental characteristics of the location? (such as water scarcity, deserted, agriculturally fertile etc.)
2. Local Issues Related to Climate Change:
   - Are there any specific local issues related to climate change evident in the case study area?
   - What is the impact of these local climate issues on the community or region in practical terms?
3. Cultural Factors:
   - What are the dominant cultural practices and beliefs in the case study location?
   - Do these cultural factors have any influence on perceptions and responses to climate change? If any, explain.
4. Socio-Economic Factors:
   - What are the major socio-economic conditions of the area (e.g., income levels, most popular employment sector, infrastructure)?
5. Gender Dimensions:
   - What are the dynamics within the community (Patriarchal or Matriarchy)
   - How are gender roles divided? (E.g. Do women go to the field with men or are only confined to take care of the household? Or they are involved in both?)

B. Locating and grounding the Project

1. Historical Context:
   - Are there any historical events that shaped the current environmental conditions of the area? (such as floods, cyclones, earthquakes, economic shifts etc.)
   - Are there any past experiences with environmental challenges that influenced current attitudes and actions?
2. Foundation of the case study:
   - What are the origins of the case study? (Did one person/organisation/community initiate the dialogue and others followed, etc.)
   - What/who were the initial drivers for the development of dialogue?
3. Community Engagement and Mobilization:
   - How was the community mobilized and engaged its members?
   - What methods were used to foster community involvement and ensure broad participation?

C. Partners Involved

   - Who were the key partners involved in the case study, and what roles do they play?
   - How often do the community and other partners engage in dialogue during the study? What was the mode/ site of interactions?

1. Feedback and Adaptation:
   - Was there any feedback mechanism developed in the planning and implementation process?
   - How was feedback collected and used to adapt or improve the approach in the study?
2. The Change Agents (Leadership):
   - Who are the key leaders or change agents within the community driving climate action?
   - How was the leadership practiced in the case study?

D. Knowledge Mobilization, Production and Dissemination

1. Knowledge Base:
   - How is this knowledge distributed across different demographic groups in the community (e.g., age, gender, education level)?

2. Knowledge Transfer:
    - Are there any mechanisms are in place for transferring climate change knowledge within the community (e.g., oral or documented)?
    - Who are the partners involved in the process of knowledge transfer?
3. Integration of Traditional /Local Knowledge:
    - How was traditional knowledge integrated into the community's climate adaptation strategies?
    - Was there a mix of traditional and modern knowledge to achieve the impact?
    - How is scientific knowledge about climate change integrated into community decision-making and planning in the project? Is the communities' knowledge validated by scientific knowledge?
    - What were the challenges in aligning scientific findings with local knowledge and practices?
4. Knowledge produced:
    - What was the new knowledge produced and how was it acted upon?
5. Dissemination of Produced Knowledge:
    - How was knowledge disseminated? In what form? Either conference? Community discussion/event or in any art form etc.

E. Resource Availability and Utilization
    - Was there any external funding involved? Who raised that funding? If not, how were resources gathered for the project?
    - Were there any technological or human resources available in the study?
    - What resources were contributed by the community, such as physical resources (by contributing labour), etc., if any.
    - What kind of resources were made available? Was it money, food, shelter etc.?
    - What was the role of the community in handling external funding?

F. Impact
    - Is there an impact on government policy? Or recognition by the government?
    - Was there an impact leading to changes in the practices of the community?
    - Was there an impact on any changes in business behaviour (such as mines etc.)
    - Was there an impact on external researchers?
    - Was there an impact on the academic community? Did it lead to any further studies by academics?
    - Did the project inspire other communities to replicate this in their own context? How?
    - How do these impacts align with the broader goals of the DECODE project?
1. Sustainability & Scalability:
    - What was the impact on the problem domain/area?
    - Are the outcomes or solutions implemented in the case study sustainable?
    - To what extent are the solutions or strategies from the case study scalable to other contexts or projects?
    - What adjustments might be needed to adapt the solutions for broader applications?
2. Innovative Approaches:
    - Were there any innovative approaches or technologies used in the case study?

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